Laura Seppänen

Learning Challenges in Organic Vegetable Farming

An Activity Theoretical Study of On-Farm Practices

Publications 1
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Abstract

The emergence and growth of organic farming is part of the rapidly changing picture and potential new functions of agriculture in industrialized countries. Agriculture and the technical cultivation issues in farming need to be seen and investigated more than ever in their societal contexts. It is assumed that the study of local and particular every-day practices in their evolving societal linkages is useful for both researchers and practitioners.

Organic vegetable farming continuously faces internal and external changes in the form of developing techniques, new administrative and advisory systems, and marketing. The concept of learning is used to describe how change is dealt with, both theoretically and operationally.

The aim of this research is to study change and learning processes and relevant developmental problems in organic vegetable farming. Challenges for learning are investigated as emergent phenomena in practical and collective farming activity. The substance and societal functions of organic vegetable farming are included in the concept of learning of this study.

The present work is an exploratory qualitative longitudinal field study applying cultural-historical activity theory to organic vegetable farming. The methodology used consists of both ethnographic field work and systematic qualitative analyses of crop rotation planning sessions and organic inspections. The methods of analysis were created in the study itself.

Learning is approached through object construction in organic vegetable farming in which two relevant and interrelated dimensions are examined. The dimension of the use of natural resources, mainly land, can be categorized into two historically formed layers that shape the object of farming: soil fertility, or maintenance of the resource base, and environmental protection. In the dimension of societal integration, three developmentally relevant categories emerge: market, administrative, and organic relations. The last consist mainly of relations with other organic farmers and advisors.

The central contradictions found in organic vegetable farming were short-term and intensive use of resources as against ecological and sustained use, and independence and self-sufficiency as against societal integration. In local activities, they generate learning challenges that form the basis of significant learning. ‘System redesign’ and a long-term perspective, including planning, managing and implementing crop rotations are learning challenges. The findings suggest that subsidies, other farmers, and extension, education and research are learning challenges in societal integration.

The processes of learning and development are often uncertain, complex and risky, and change is neither linear and nor predetermined. Learning in this study consists of expansive actions or practices that can be interpreted as moving towards both the
ecological and sustained use of natural resources, and societal and entrepreneurial integration, in particular local farming activities in time and space.

The purposeful creation of new reflective learning tools in this study is based on analyses of contradictions and learning challenges. Crop rotation plans are both learning tools and devices which evolve in cooperation between farmers, advisors and administrative agencies. The framework of the study (Figure 3, Section 2.1 of the thesis) is a model which can be used as a learning tool for reflection. Methods and tools for analyzing learning challenges are the results of the study. The visual learning diagrams ‘strategies for increasing product volume’ and ‘three orientations towards farm workers’ were created and used. Ways of communication such as ‘speech across the years’ and joint negotiation between the farmer and the inspector reveal interesting possibilities for talk-based learning tools.

The findings suggest that learning in organic vegetable farming is a continuous, dynamic process. What needs to be learned is partly created by the farmers and other participants. The activity theoretical concept of the object has potential for seeing both the material and the social aspects in the formation of the farming activity. By its activity theoretical interpretation of organic vegetable farming, and by offering tools for reflection, the present work contributes to understanding and discussion of development of organic farming.
Summarized Publications and the Author’s contribution

This thesis is based on the following articles, which were referred to in the text by their Roman numerals:


Laura Seppänen was responsible for planning and data gathering, analyses, interpretation of the findings, and the writing in articles I, II, III, V and VI.

Heikki Koskimies has contributed to article III by viewing and interpreting the videotaped data on organic inspection and its field conditions, and by offering insights and comments on the text of the article.

Juha Helenius has contributed to article V by specifying the agroecological content of the analytical concepts 'system redesign' and 'input substitution' and by commenting on the data analysis and the text in its various versions. The structure of article V was jointly outlined by both authors.

Yrjö Engeström is the main author of article IV. Laura Seppänen contributed by writing one of the three empirical cases, jointly planning the introduction and conclusion parts of the article together with Yrjö Engeström and Anne Puonti, and by commenting on all parts of the article in its successive draft forms.
1 Introduction

1.1 Background and Aims of the Study

The view that agriculture’s sole purpose is the production of standardized products dictated by an increasingly global market is contested. The continuing price squeeze emphasizes functions that acquire new values in response to evolving Western urban societies, such as the production and maintenance of the environment, the provision of safe foods and enhancing local identity. (Hubert et al., 2000.) While agriculture is entering a more open market economy within the European Union, it is also more dependent on direct subsidies and regulations. Environmental considerations bring additional challenges for farmers (van der Ploeg, 2000). Part of the changing picture of agriculture is the emergence and growth of organic agriculture.

Organic farming as an activity is relatively new, extending as a social movement in many industrialized countries between 1970 and 80. During the 1990s, demand has favored an increase in organic agriculture. In the EU, organic farming was seen to positively promote aims such as a decrease in overproduction, environmental protection and rural development (Council Regulation (EEC) 2092/91). According to Michelsen (2001), the growth of organic farming is explained neither by political support nor pure market forces. Rather, it is promoted through a continuous series of initiatives originating in various sectors of society. The transition, or ‘critical juncture’, of organic agriculture from a marginal social movement to institutions of agricultural policy and to globalizing and corporatizing food markets has inspired researchers (Buck et al., 1997, Guthman, 1998; Goodman, 2000) as well as making those in the organic sector to wonder where to go now (Kirschenmann, 2000; Vos, 2000).

One of the key questions in the development of organic farming is illustrated by Campbell and Liepins (2001). Does organic agriculture conventionalize,¹ become commodified and lose its essence in this ongoing process? Authors such as Tovey (1997) and Buck et al. (1997), referring to developments in Ireland and California, see organic farming as co-opted or even corrupted by other tendencies that blunt its transformative potential. Others are more optimistic, seeing organic agriculture as a useful and complex example of how the concept of nature features in food production and consumption (Goodman, 1999; Kaltoft, 1999). Besides, organic farming as a social movement still exists (Michelsen, 2001; Campbell and Liepins, 2001). “Even if it is not revolutionary, organic agriculture and food consumption at least highlight some ways in which the broad tendencies in food production and consumption are not linear, inevitable and uncontested” (Campbell and

¹ Conventionalization here means that capitalist wage and commodity relations push organic farming towards the conventional farming model in which smaller farms become bigger, debt loads increase, labour is replaced by mechanization and other industrial inputs, and marketing becomes export-oriented rather than local (Hall and Mogyorody, 2001).
Liepins, 2001). In this debate, organic agriculture seems to continue with its initial aim of critical opposition to, co-evolution with, and alternatives to conventional agriculture and globalizing food markets. The conventionalization argument will be touched on again in the light of the findings at the end of the thesis.

The recent discussion about organic farming in Finnish agricultural research is often centered around its environmental impact. A study led by Grönroos and Seppälä (2000) compared the environmental impact of conventional and organic milk and rye bread production through their life cycles. In this evaluation, organic milk production was found to have less negative environmental impact than conventional, while organic rye growing, separated from animal production, was less beneficial than conventional. The assumptions, methods and results of this study have been much debated. The organic way of farming has been seen to benefit biodiversity more than the conventional one in many studies, (Helenius, 1995). In this discussion organic farming is judged and defined in terms of its ability to correspond to or to meet societal and political aims of avoiding environmental impact, or of enhancing environmental protection.

The history of this study is linked with my personal history of working as an agronomist with organic farming from 1989 onwards. In 1995 I was involved in a research project called Participatory Development of Organic Vegetable Farms. Its central aim was to identify the most relevant developmental problems and research topics in organic vegetable farming (Seppänen et al, 2000). Facing the farming practices soon made it obvious that the heterogeneity of agricultural disciplines as well as the varied perspectives of farmers, advisors and researchers made it difficult to answer this question. Intuitively there was a feeling that our agricultural disciplines could not shed light on the question of relevant developmental problems, which made me change my perspective on my work and look for new theoretical approaches. Obviously, what was lacking in the project was not so much theoretical understanding of the human ‘side’ of farming, but understanding the whole of farming as a human endeavor or activity. The natural resources, machines and other material things were important in the production of organic vegetables, which, to my mind, could not be left out in understanding farming. There was a need to include both the material and the human or social aspects in the study.

This need came close to what Hubert, Ison and Röling (2000) say about the ‘problematique’ of industrialized-country agricultures. The authors state that agriculture is entering a phase of reflexivity in which issues of nature and technology can no longer be addressed independently of their place and role in societal thinking and behavior.

The various fields (biological, physico-chemical, technological, economic, social) that are combined into new research issues are shaped around the actors’ concrete actions and practices, the categories and rules they create in order to act, and the objects that they work on and about which they seek to develop agreement. Analysing these practices on the basis of in situ observation, therefore, seems to be one of the most

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2 For the concept of practice and its relationship to activity and action, see Section 1.2. and Figure 1.
interesting ways to produce action-oriented knowledge, regardless of whether the action is part of something that is formally organized or whether it is to be carried out in a less precise context. If the study of innovation and change processes in rural and agricultural activities consists first and foremost of studying processes of learning and of knowledge production and exchange in individual and collective actions, then the theoretical framework of research and the position of the scientists both need rethinking. (Hubert et al., 2000; 23-24).

The Nordic courses in ecological agriculture for post-graduate students (Lieblein et al., 2001) encouraged me to work with interdisciplinary research. I turned to activity theory because the concept of contradiction seemed appropriate to the analysis of organic farming, and because the approach seemed both practical and theoretically sound. The concept of learning roughly corresponded to the developmental interests of the Participatory Development of Organic Vegetable Farms project.

The change in organic farming not only deals with the conversion from conventional to organic farming. The infrastructures supporting organic farming are still under construction and organic agriculture is evolving rapidly. There are both internal and external changes going on in the form of developing techniques, new administrative systems, and marketing. In Finland, EU integration in 1995 brought considerable changes to agriculture in the form of deregulated markets, declining prices and new administrative subsidy and regulation systems. The change is continuous. The concept of learning is used to describe both theoretically and operationally how change is dealt with.

This is an exploratory qualitative longitudinal study of change and learning in the activity of organic vegetable farming. The question of learning and change is approached through ethnographic field study on organic vegetable farms and through qualitative analyses of crop rotation planning sessions and organic inspections. Learning is investigated in the relations between three levels: 1. the general activity of organic vegetable farming, 2. particular farms as activity systems and 3. situated actions and individual practices.

The aims of this study are:
1. to reveal change and learning processes in the activity of organic vegetable farming and in its actual practices.
2. to discover and analyze relevant developmental problems in this activity.
3. to investigate the role of both material, particularly natural resources, and the human ones in organic vegetable farming. The study thus aims at highlighting the importance of simultaneous consideration of social and material aspects in the construction of activities.

These aims relate the study to three fora. The first is the perhaps emerging research field of ‘knowing and learning for change in agriculture’ (Cerf et al., 2000; Ison and Russel, 2000; Ljung, 2002; Röling and Wagemakers 1998; Paine, 2000; and others). Agroecology and farming systems research are linked to this forum (Hubert et al, 2000; 14). The second is
rural sociology with its farming development theorizing (van der Ploeg and Long, 1994; 1999; Leeuwis, 1993; Cristóvão, 1994) and research on organic agriculture (Michelsen, 2001; Tovey, 1997; Mononen, 2000). The third is the forum of cultural-historical activity theory (Cole, 1996; Engeström, Miettinen and Punamäki, 1999; Chaiklin, Hedegaard and Jensen, 1999). The link between the thesis and the first forum is obvious, since it considers learning and change in agriculture. Farming and organic agriculture have been theorized about both in rural sociology and in this study. The thesis is an elaboration and application of activity theory in the field of organic vegetable farming.

The structure of the thesis is as follows. In Section 1.2 the basic concepts of the cultural-historical activity theory will be introduced. The two farms involved in the study will be described in Section 1.3, which also tells their stories.

The aim of chapter two is, first, to locate this study between rural sociology, activity theory and the emerging field of ‘knowing and learning for change in agriculture’ by comparing it to other research. Second, the aim is to ontologically position the present work by re-examining the dimensions of the central framework of the study. The question of endogenous and exogenous development and the heterogeneity of farming styles will be dealt with in Section 2.1, which compares the framework of this study to a developmental diagram by Jan Douwe van der Ploeg (1994; 2000). In the articles, different conceptualizations of the use of natural resources and of societal integration have been applied in analyzing dynamics and learning challenges in organic vegetable farming. The nature and historical bases for these conceptualizations will correspondingly be investigated in Sections 2.2 and 2.3. Section 2.4 shows how the relationship between the material (use of natural resources in the farming activity) and the social aspect (societal integration) is understood. Section 2.5 shows how learning is conceptualized and compares it to other studies. Chapter two is to be read as an essay in which the central themes of the articles (I-VI) will be presented and pondered upon.

Chapter three is a methodological one. The aims of the study will be formulated as research problems in Section 3.1. Questions concerning the specific methodology and data of the study will be described in Section 3.2, and the qualitative methods used in Section 3.3. Section 3.4 deals with the question of generalization. The research process, including the stance of the researcher towards organic vegetable farming as a research object, is assessed in Section 3.5.

Chapter four presents the key findings (from articles I-VI and further elaboration of the findings realized in Sections 2.2-2.4), and discusses them (Section 4.2). Lastly, Section 4.3 suggests challenges for future research.
1.2 Farming as Activity - Basic Concepts

I will briefly introduce the main theoretical concepts used in the study, which are activity, practice and action; object, contradiction, tool, and historical layer. The concepts of learning challenge and the zone of proximal development will be introduced in Section 2.5, Learning. For a more detailed description of methodological and methodical processes and choices, see chapter three.

Antti Eskola (1999) describes two underlying ideas in empirical studies in psychology and social sciences. One is that a phenomenon that is being explained is determined by certain factors, through the mediation of particular mechanisms. He calls this a scientific law, following a mechanistic-deterministic paradigm. Another is that explanatory factors are sought in two domains: a person with her disposition and traits, and the environment, including the situation. Despite the interaction between the two domains often being acknowledged, Eskola argues that something else is still needed, this being the activity that transcends the person-environment dichotomy. Activity needs to be taken as a basis for the analysis of behavioral and social phenomena (Eskola, 1999; 109). Laws and rules do have a meaning, but human activity is not determined by them. Eskola describes this in a realistic paradigm of human action in which an actor takes into account, according to some logic, that Y follows from X. Here, attention should be paid to 1) the structure and development of activity and its various meanings, 2) the laws and rules that actors take into account and 3) the logic determining that they do so. Actors cannot step outside the law, but they do have the freedom to choose what effects they allow those laws to have on them (Eskola, 1999; 112). The points made by Antti Eskola are relevant to this study, in which farming activity does not readily follow a linear and rational logic.

In general, human conduct can be considered as individual or social. In the present study, as for Leont’ev (1978; 51), human activity is not considered as isolated from social relations and from the life of society. Activities are collective and formed during history. An activity as a research object is constructed by the researcher, but it is not merely his or her, or human, construct.

Beside theory, research concepts need an empirical definition. The key feature of farming activity here is that it is production.\(^3\) The normal unit of production is the farm, which is a central activity system in this study. Farming as an activity can be understood as ‘maintaining the survival of the farm’. This motive may indeed be embedded in the object of organic vegetable farming, but the definition of farming activity I assume necessarily includes a production part where vegetables are grown for sale to customers. The use of natural resources, especially land, is emphasized within the productional farming activity definition.

\(\footnote{3\text{ This is partly due to my background as an agronomist. The production perspective fits well with activity theoretical studies of work activities.}}\)
Beside production, a farm is also a place for a farmer family to live. This study considers the family as part of production, but does not focus on family life. Organic vegetable farming does not necessarily coincide with the production activity of the farm, because there may be other lines of production and income.

An activity system consists of the interdependent elements of subject, object, instruments, rules, community and division of labor (Engeström, 1987; 78). Activity is driven by its object. The concept of the object (I, page 283; VI, page 132; II, page 88; IV) includes both the given material and non-material entities and their subjective meaning, which are both transformed in the activity. The object has its own resistance and self-movement, which means that objects have, in part, a life independent of the actors who work on or think of them. An object is also constructed by the subjects, or actors, of an activity, however. The motive of activity is embedded in the object. The motivating capacity of an object gives direction to an activity (IV, page 152) and thus shapes its development. An activity and its object can only be understood in dynamic movement, as a temporal process, which methodologically means considering their theoretically interpreted histories beside actual activities (II, pages 88-91). This study views learning through the diversity, challenges and potential in object construction in organic vegetable farming activity.

The tools, or instruments, of an activity give a societal meaning and structure to individual perception and experience (R. Engeström, 1999; 328). Sometimes the activity requires that tools be taken as objects for some time, and objects may become tools.

According to Engeström (1987), an activity system is in constant imbalance and development, and the concept of contradiction has a special significance in this development. “Contradictions are not just inevitable features of activity. They are the principle of its self-movement and … the form in which the development is cast” (Il’enchkov 1977; 330). This means that new qualitative stages and forms of activity emerge as solutions to the contradictions of the preceding stage of form.” (Engeström, 1987; 91). Contradictions provide an insight into why people become motivated to learn (Toiviainen, 2003; 50).

Collective human activity exists in the form of individual actions (Leont’ev, 1978; 64). Section 3.2 will explain the methodology of how individual actions have been used in the analysis of collective organic farming as activity. Actions are mostly visible as part of work processes. However, neither actions nor their local explanation can deal with the contextual properties of an activity (R. Engeström, 1999; 328). Figure 1 shows how the Leont’ev’s general structure of activity (1978) has been modified for the purpose of this study.

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4 For the relationship between family and farm ecosystem, see Sontag and Bubolz, 1996; for activity-theoretical analysis of home activity, see Korvela, 2003; and for the study of enterprise-household complexes, see Römer-Paakkanen, 2002.
Figure 1. The hierarchy of operations, actions, and practices as groups of actions, and activity, which is simultaneously particular to a farm and general. (See also Section 3.2).

The level of activity consists of both the general organic vegetable farming, and that which is performed on particular farms as activity systems. The farming activity consists of practices as groups of actions. Actions, in turn, consist of operations. The concept of practice in this study is a cluster of actions which follows a more or less culturally formed script.

This study does not interpret activities in terms of the properties of individuals. Rather, the main interest is in the interplay between organic vegetable farming activity and its practices and actions. Farming activity consists of practices and actions that are carried out by individuals or groups of individuals. The activity-level, which is collective and historical, is used to interpret and understand the situated practices and action.

Farming activity is looked at in its temporal changing process, making it possible to distinguish different historical layers in an activity and its object construction. Two or more historical layers can simultaneously influence the actual practices and actions of an activity.

Section 1.3 will introduce the farms in the study and tell their stories. The aim of these accounts is to provide the readers with a context to which to relate the theoretical logic of this study. Real life is always richer than any theoretical construction of it. Section 1.3 tries to give readers a sense of the real life of these farms.
1.3 The Farms in the Study

The two farms described below were selected for the study because they represent two central and different historical courses or trajectories - from conventional agricultural farm and conventional horticultural enterprise - into organic vegetable farming. The centrality of these paths is due to understanding of organic vegetable production at the crossroads of agriculture and horticulture where skills, machinery and crops from both are needed.

The Alanen Farm

Antti Järvitalo, 42,5 and Leena, 36, have three children of school age. During the research period 1997-98, the farm had 22 ha of mostly stony fields. During its history, the farm, by local comparison, has been a relatively large and wealthy one. Besides farming, there is a significant acreage of forest and wood processing on the farm. Antti’s parents live on the farm as well, and take part in the farming tasks. From 1996, Leena started to work off-farm part-time. Antti is the farmer but Leena participates in the accounting and in planning the farming. The family belongs to a marketing cooperative of organic producers that sells organic vegetables and potatoes to wholesale markets.

Antti took over the farm in 1982 and started to cultivate potato on a larger scale in 1986. Leena and Antti signed a contract about organic farming in 1991, which was the second year the subsidy was available. In 1991, the milch cows were replaced by beef cattle. At the end of 1995, they sold even the beef cattle because of allergic ailments and for economic reasons, the price of beef having fallen considerably. They were looking for proper crops and experimented with various vegetables. In autumn 1995, Antti and his six colleagues in organic farming founded together a company to market their potato and vegetable products. The partners became important colleagues in supporting organic vegetable farming. During 1996-1998, Chinese cabbage and potato were the main crops. Almost incidentally Antti was offered a large acreage (46 ha) of fields for rent which was realized apart from 1999. From there on, the Alanen farm cultivated mainly potato for local municipal institutions and continued occasional experiments with vegetables. The role of the marketing company in the activity of the farm diminished. Antti turned instead more to cereals, forest and wood processing and even worked off-farm for some time. Potato production for local demand continued.

The Kola Farm

Maria Kola, 49, and Kai, 60, both worked full-time on their farm during the study period. The fields were previously subdivided from a great manor that went bankrupt in the early 1960s. Maria, who had been working in the local bank, worked with flower production in the greenhouses, and sold flowering annuals at a market-place in Helsinki. The husband

5 The ages in 1999. The names are fictional. Leena is called Eeva in article VI.
took care of the conventional cabbage production. They had three children. Maria’s husband died in 1987, and she continued farming on her own for some time. She then married Kai Kola, a specialist dental technician who had worked as an entrepreneur in Helsinki for a long time. In 1991, they made a contract with the state about conversion to organic farming of their 3.5 hectares of fields. The main crops are onion, carrot, potato and leek. They also cultivate minor amounts of beetroot, swede, lettuce and other vegetables. They aimed at early production, which means they start selling in June-July. The main income came from flower production in greenhouses.

Each year they increased their organic vegetable production. In 1996, they rented 5 ha of new fields near their home and farm. Kai Kola looked for and found new clients in the regional supermarkets with remarkable success. The problem was to run the activities of greenhouse flower production and organic vegetable farming simultaneously. In 1997, the Kolas applied for a considerable subsidy to end the greenhouse production and their application was approved. The greenhouses were dismantled in fall ‘97. From there on, they were dependent on income from organic vegetable farming. In spring 1998 there was still good demand, and the Kolas increased vegetable acreage. In November 1998, Kai Kola was accidentally hurt while building a new vegetable storage. The Kolas had to stop their career as farmers and sold their fields to another organic grower.

Chinese Cabbage and a Strange Disease

When planning the crop rotation in January, 1998, Antti Alanen talked about risks in the production of Chinese cabbage. I knew an adviser from another part of Finland who had written about Chinese cabbage in the horticultural magazines by name. I suggested that Antti could phone him and ask for advice in avoiding diseases. Antti hesitated, but still tried to phone him, but the adviser was on a holiday.

The following summer was rainy. The Chinese cabbage was covered with gauze in order to avoid insect pests. In August, Antti was pondering on whether the cover should be taken off or not. A respected colleague from the marketing company suggested it, but the same colleague had previously given bad advice. Antti decided to let the cover stay.

In December, indeed there was something wrong with the quality of the Chinese cabbage in the storage. Here and there on the leaves of the products were little black or grey dots. So many discolored leaves had to be taken away that the sorting was slow and unprofitable.

Antti had contracted for a big volume of Chinese cabbage with a wholesale firm through the marketing company. Now, he had to cancel the contract. The manager of the company said that Antti should negotiate with the wholesale firm himself about canceling the contract. Antti tried to explain that the disease made the sorting absolutely unprofitable, but this was not the right message for the buyer. Because of the disease, much of the
Alanens Chinese cabbage was not sold, a drastic loss in income. Antti was fed up with Chinese cabbage, and never wanted to grow it again, not only because of the disease but because of other uncertainties, above all in marketing. After 1998, the Alanen farm produced other vegetables than potato only occasionally.

But what was the disease on the Chinese cabbage? With Antti’s help, I sent a sample of infected product to the Agricultural Research Centre for analysis. Various fungi were tested for, but they were not the cause of the disease. The most probable diagnosis is a storage-induced physiological disorder called ‘vein streaking’ (Snowdon, 1992). This means that the field conditions and the gauze did not cause the disease, at least directly. Antti said that similar disease dots can often be seen on the conventional cabbages sold in supermarkets, but he thought organic products with a better price need to maintain a higher quality. I will come back to this story in Section 2.3.

Couch Grass and the Path towards Larger-scale Production

In 1996, the Kolas rented another 5.5 hectares of fields. As they had acquired new customers, their previous 3.5 hectares was understandably becoming small. This story concentrates two rented field plots, Field 1 (3.63 ha) where oats had previously been grown conventionally for more than a decade, and Field 2 (1.07 ha) that had been under ryegrass and pea-oats mixture. Immediately after renting, the local organic advisor made a conversion plan for the newly rented fields. In spring 1997, Kai Kola sowed spring wheat, for the first time in his life, together with clover-grass mixture to Field 1. The seed-drill was borrowed from another farming couple the Kolas cooperated with. The wheat grew only moderately well but the clover-grass mixture was impressive. The wheat was harvested in fall 1996 and the clover-grass mixt ure grew there during the summer 1997. During both summers I saw inflorescences of couch grass in the Field 1 and told the Kolas who were busy with their vegetable fields, about them. The clover-grass mixture was not mowed in 1997.

In spring 1997, the Kolas decided to hire a contract planter with an automatic onion planting machine. The contracted farmer was driving, and Maria Kola was sitting on the planter. The rows became sparse and therefore more land than planned had to be dedicated to onion growing. But the worst was that the contract farmer did not drive straight rows but followed the amorphous forms of the field edges. The onion could thus neither be flamed nor hoed, and the manual weeding labor during 1997 increased substantially. The Kolas realized that they should have had their own planting machine, which in fact they bought the following year. It was not possible to keep all onion fields clean, and Field 2 became infested with weeds, especially couch grass.

In 1998, the economic pressure from having finished the greenhouse production and their success in marketing made the Kolas look for larger vegetable fields than ever. A new crop rotation plan was drawn up in March, 1998 (I, II and VI). Field 1 had to be improved for
vegetable cultivation. Ditch margins had to be freed of big willows and birch trees. The Kolas did an enormous job in cutting trees. They hired an excavator and driver to improve the drainage, but the excavator never arrived. Field 1 was planted with potato, leek and carrot. Field 2 was left as open fallow until mid-July to weaken the couch grass, after which green manure (vetch and ryegrass) was about to be sown. However, the summer was extremely rainy. Green manure could not be sown to Field 2 because of weeds and wetness. Field 1 did grow well, but enormous quantities of weeds caused a lot of work. Only minimal attention was paid to couch grass during organic inspection in August, 1998 (III). Kai Kola tried to get rid of the couch grass roots with a help of potato harvester. Although they could harvest yields and sell products, the Kolas were tired and depressed.

The hard summer made them doubt their way towards large-scale organic vegetable production. In October 1998, Maria Kola said that she was turning to the view that a smaller acreage with vegetables would suffice. They would get the same amount of produce with less work. They also had been discussing the possibility of not renting Field 1 and Field 2 any longer. I will return to this in Section 2.4.
2 Exploring the Theoretical Framework of the Study

As mentioned in the introduction, the aim of chapter two is to locate this study between rural sociology, activity theory and the emerging field of ‘knowing and learning for change in agriculture’ by relating it to other studies.

In Section 2.1 I will first describe and discuss the rural sociological theories of endogenous development (van der Ploeg and Long, 1994) and farming styles (van der Ploeg, 1990, 1994). These pieces of research have been selected because of their interesting theorizing about farming involving both similarities and differences compared to this study. Sections 2.2, 2.3 and 2.4 contribute to the ontological positioning of this thesis, the main question being the relationship between the use of natural resources and the society. The conception of learning in this study will be dealt with in Section 2.5, which deals with learning literature in the field of agricultural research.

The link between these sections is the theoretical framework of the study. Section 2.1 compares it to a diagram by van der Ploeg (1994). Sections 2.2 and 2.3 explain its dimensions, while Section 2.4 describes how the interplay between these dimensions is understood and explains how the framework has been used in the study. (A more detailed description of how the framework came about is found in articles I and VI. All articles show modifications in its uses.)

Two things more need to be said about chapter two which shows how the present study and its approach reveal perspectives about learning and development that are potentially interesting and useful to others. In this task I use the literature of various methodological and theoretical perspectives. My intention is not to describe them and their theoretical roots in their own right. Rather, I use them in order to make the approach of this study clearer.

Chapter two includes two levels: the general level of activity theory, and that of its application in organic vegetable farming. The text flexibly moves between these levels, because movement between the general and the particular is exactly the nature of activity theoretical thought. The movement-idea between the general and the particular (=on-farm) organic vegetable farming is repeated in the methodology of the study (see Section 3.2).

2.1 Endogenous and Exogenous Development

According to Ann Long and Jan Douwe van der Ploeg (1994), endogenous development is founded mainly on locally available resources such as the local ecology and labor force, and local patterns linking production to consumption. These oppose endogenous development to modernization of agriculture where development is driven by actors external to producers. The concept of modernization emphasizes an essential rupture with
existing agricultural practices and the types of discourse of the countryside (Long and van der Ploeg 1994; 2).

The authors claim that there is ignorance of how to conceptualize and analyze endogenous development patterns. The relevance of endogenous development is not generally recognized or is considered minimal. In order to understand agrarian development, it is necessary to analyze the social relations of production (town-country relations, the intersection between agriculture and local, regional, national and international economies, relations in local culture and family patterns, etc.) “These social production relations not only determine and therefore structure the way farming is related to markets, technology and policy, but also imply frequent negotiation, adaptation and/or transformation of the goals, instruments, tendencies, directives and rationale contained in markets, technology and policy.” (Long and van der Ploeg, 1994; 4.)

The authors see the dimension of exogenous or endogenous development patterns as crucial to producing heterogeneity in agriculture. For those who follow the exogenous development pattern, it is the outside elements that compose the conceptual model or rationale from which the eventual utility of local resources is judged. If they do not fit, they will be considered as ‘worthless’ or a ‘hindrance’ to change. In endogenous development patterns, it is the other way round. The local resources developed in local styles of farming serve as a yardstick for evaluating the utility of ‘external’ elements. Even if they are internalized, it is often through a careful ‘deconstruction’ and ‘recomposition’ so as to guarantee a maximum fit with local conditions, perspectives and interests.

In the introduction to their book, Long and van der Ploeg (1994) clearly suggest the importance of considering and analyzing endogenous development. In ‘canonical scientific approaches’ it is difficult to understand the empirically-relevant practices of endogenous development theoretically (Benvenuti, 1994). However, scholars often look at endogenous development from the point of view of policy development, which is difficult, because “there is no general scheme for endogenous development” (Long and van der Ploeg, 1994; 6).

I consider this study as an inquiry into the development of farming in which the endogenous and the exogenous can be seen in the empiria. I will try to elaborate these concepts a bit further, arguing that even in the changes that superficially seem exogenous, there is always local meaning-creation going on; that is, local ‘deconstruction’ and ‘recomposition’ in the form of negotiation, adaptation and/or transformation of the goals, instruments, etc. Development and change interestingly seem to include an interplay between endogenous and exogenous elements.

Farmers ponder on alternative ways of reacting to many types of changes and situations. The choices resulting from these ponderings are seen in planning processes and the outcomes of crop rotations. ‘Exogenous’ factors like the price of barley, agri-environmental requirements, or expected demand are not merely exogenous but markedly
internal to farming. Farmers need to actively take some stand or position on them. Article I 
hows the heterogeneity of these positions by revealing the contradictory dimensions of 
development. These are understood by the different object constructions produced during 
the histories of the farms. This corresponds to Long and van der Ploeg’s (1994; 5) claim 
that “empirical heterogeneity is neither a random nor an insignificant phenomenon.”

In this study, a framework for the task of analyzing the existing heterogeneity of the object 
construction was developed, based on an interpretation of the history of Finnish 
agriculture and the development of organic agriculture in Finland. In this sense, the 
framework (Figure 2) is a researcher’s construction, which itself is necessarily partly 
‘exogenous’ to the activities of the study farms. Despite this, or possibly because of it, the 
framework is able to reveal interesting dynamics and variations in the object construction 
of the farms.

![Figure 2. Four types of object construction in organic vegetable farming (I, page 285; IV, page 164).](image)

The framework is not only based on histories. Farms involved in the study are figured as 
activity systems where “in practice, the farmers do not simply ‘adopt’ new given organic

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6 The so called agricultural income system, a shielding government policy, existed for more than 30 
years (Routamaa and Vesalainen, 1992; 3). The prices of major agricultural products were negotiated 
between the Farmers’ Union and the state. Farmers did not have to carry the risk of marketing and 
on specialization and vertical integration taking place in the 1970s. 
Together with vertical integration, the system of collecting raw materials for the industry were 
developed. From the perspective of farmers, the situation was easy: milk, cereals and animals were 
picked up from the farms …The responsibility of a farmer ended when the lorry carrying the raw 
material left the farm. The producer was not responsible if the products made from his raw material 
were sold or not …From the point of view of future challenges in the countryside it was bad that the 
producer identity and not entrepreneurial identity was strengthened. (Katajamäki and Kaikkonen 
1991; 47. Translation from Finnish by LS).

7 In the history of organic farming, I draw on sources that explain soil fertility and ecological, diverse 
maintenance of the farming system as a major motive in the foundation and early development of 
organic farming (Balfour, 1949). This also served as a response to specialized and intensive 
conventional agriculture that relied on synthetic fertilizers and pesticides. The question of soil fertility 
has already been debated during the second agricultural revolution (1830-80) (Foster, 1999:373-378). 
Further, Marx’s concept of metabolic rift (Foster, 1999) could be useful in the study of a general 
historical background of organic agriculture.
techniques, or a new entrepreneurial work management. When they do it, they do it in their own ways, typically mixed with steps back towards the old way of farming. On the other hand, they may embark on solving the existing contradictions in a qualitatively and historically new way” (VI, page 138). In this way, the framework is also based on the ‘endogenous’ translation done on the farms. In Figure 3, the shape of the framework has changed slightly, because it recognizes the contradictory nature of the object. Movements in both directions are possible along the dimensions of the object.

![Figure 3. Framework for the study of expansive learning in organic vegetable farming (II, page 89).](image)

As we can see from Figures 2 and 3, the focus has shifted from entrepreneurial integration to societal integration in general. Roughly speaking, the nature of the use of natural resources dimension was contradictory on the Kola farm, as was the dimension of entrepreneurial integration into society on the Alanen farm (I, VI). The change from ‘entrepreneurial integration into society’ to ‘societal integration’ in the framework, as we can see from Figure 2 to Figure 3, arose from the observations and analyses that the Kola farm also had its learning challenges in societal integration, which perhaps were not immediately entrepreneurial challenges (see article II). The empirical data of the study has been analyzed by realizing the dimensions of the framework using different concepts.

Now, our question is where change comes into farming activity, from inside or from outside the farm? At first sight, it seems that this question is embedded in the vertical dimension of the model, societal integration upwards showing development from outside, and independence and self-sufficiency downwards showing internal development on farms. I will argue that it is not quite so. The model needs to be opened up. I will first compare the framework in Figure 3 to a diagram developed by van der Ploeg (1994) in describing endogenous development and styles of farming.
About Farming Styles

Van der Ploeg (1994; 7) suggests that the study of farming styles is a promising methodological perspective for identifying phenomena that embody forms of endogenous development. Beside production of marketable goods, agriculture includes the mobilization and reproduction of resources, that is, the necessary labor, objects of labor, and means. Van der Ploeg (1990) analyzes the heterogeneity in agriculture from the point of different ways to organize this reproduction, distinguishing two different development patterns as a basis for farming styles, “relatively autonomous, historically guaranteed reproduction”, and “market dependent reproduction”. In the former, the reproduction of resources relies more on non-market resources and relations, while in the latter, commercial markets outside farms are essential in the organization of reproduction. This means that farming styles depend on the mobilization and reproduction of resources, which can be done through markets.

Apart from mobilization and reproduction, production means conversion of resources into values. Particular techniques imply ways of combining resources so as to obtain the required amount of value. Science and agribusiness to a large degree design and prescribe certain technologies, but they are often deconstructed by the craftsmanship of farmers (van der Ploeg, 1994; 9). Van der Ploeg describes Figure 4 as the ‘room for manoeuvre’ of farmers’ context, framed by the dimensions of markets and technology, in which various positions for farming are possible.

![Figure 4. Room for manoeuvre (van der Ploeg, 1994; 9).](image-url)
Van der Ploeg discusses these relations using a diagram depicted in Figure 4. Distancing from and/or integration into markets and technology is a matter of strategic reasoning embedded in local history, ecology and prevailing politico-economic relations. The positions created within the ‘room for manoeuvre’ specify social relations of production, and thus condition future development and decisions.

Figure 4 is interestingly different from the model represented in Figure 3. The main difference is that in van der Ploeg’s diagram (Figure 4) both dimensions are about relations, while the framework in Figure 3 incorporates all relations into the vertical dimension of societal integration. The framework in Figure 3 does not suggest that the use of resources is unrelated to social and societal relations. Rather, it is an analytical tool for analyzing how such relations interact with the material (natural resources). (The resources as such are not depicted in Figure 4, but come into the picture through both dimensions – on the horizontal axis through low or high market integration, and on the vertical axis through integration into or distancing from technological designs given externally by science and agribusiness.) In this respect, these models have different analytical purposes.

Figures 3 and 4 have similarities as well. They are both based on theoretically similar understandings of farming as work processes. Both attempt to visualize farmers’ space of possibilities considering it as a social construction materialized in farming processes. Turning the dimensions the other way round, the technology axis can be seen as representing different forms of resource use (compare the horizontal dimension in Figure 3), and markets are a special form of societal integration. The relation to technological designs is differently present at the edges of the horizontal dimension in Figure 3 ‘ecological and sustained use of resources’ and ‘short-term and intensive use of resources’.

I will argue why, as I see it, Figure 3 serves the purpose of understanding the ‘room for manoeuvre’ of farmers in actual Finnish organic farming better, while raising some theoretical issues about development.

Van der Ploeg (1994) exemplifies the diagram in Figure 4 by describing two different development patterns in marginal rural areas. The first pattern is to move upwards and to the right in Figure 4 by implementing exogenous technological models and by integrating into existing markets. The second pattern, which van der Ploeg calls an alternative position, is to go downwards and to the left. Here, farming is based mainly on non-commoditized processes of reproduction, which means that resources are reproduced on-farm or otherwise outside market-based relations. Apart from this, the quality and quantity of farm labor is optimally used to convert resources into products. Van der Ploeg (1994; 13) mentions farms specializing in the production of high quality or ecological products which depend on particular labor processes and certain local resources as examples of the alternative position. Alternative means here that craftmanship is essential and direct application of current technological models is excluded.
Organic farming has similarities to this alternative position, having largely excluded the technological prescription of mainstream conventional agriculture. The use of local resources emphasized in organic agriculture corresponds to van der Ploeg’s notion of the non-commoditized processes of reproduction. Figure 4 with its alternative position going downwards and left would nicely describe the beginning of organic farming on single pioneering farms. During the development of organic agriculture, however, there is an increasing need for established markets and new technologies. Once new alternatives have expanded, they need to reproduce the dependencies either by creation, transformation or modification of technologies and relations. Benvenuti (1994) describes this situation: “What really needs developing in this case is, first of all, sufficient, sufficiently skilled and sufficiently non-canonical research about the way(s) to [utilize locally a given aggregate of products and /or production factors]…one would also have to build and guarantee a purposeful institutional apparatus in order to ensure sufficiently the practical realization, locally or regionally… one would have to conceive and pursue an outspoken institutional policy to let the new local productive arrangements … consolidate and gain enough economic space, even if this might imply running counter to the common official policy of the day” (Benvenuti, 1994; 170). After endogenous initiatives there may be a moment when development may become exogenous, or at least which requires a re-formulation of the notion of endogenous development. This shows that ‘exogenous’ can be understood either as an impact from outside, or as an expansion that moves outwards from inside.

The challenge faced by organic vegetable farmers, as I see it, is not so much to get rid of technology and markets, as van der Ploeg’s diagram suggests, but to create and/or integrate themselves into suitable technologies and markets. Thus Figure 3 seems to correspond better to the situation in organic farming than Figure 4. Figure 3 shows the situation in which the new pattern of farming embedded in the alternative position has become popular: while craftsmanship and social resistance, suggested by van der Ploeg, remain important for the creation of technology, they are not enough in the new situation. Technology needs not only to be created and re-shaped, but some standardization is necessary as well. Marketing channels also need to be reshaped or created anew. All this means increased societal division of labor in organic farming. In short, the organizational and institutional setting of Finnish organic farming is being developed and can be influenced by local actors. All these relations have an impact on how resources are used.

Van der Ploeg (2000) later describes a farming style called farming economically that can be equated with ‘low-external-input agriculture’ as a viable and flexible strategy in agriculture, offering potential for rural development. Referring to authors such as Leeuwis (1993), he states that “the interrelated whole of (new) technologies, prescriptions, laws and regulations (especially generic legislation to reduce pollution) and knowledge stocks, for example, is evolving in such a way that any room for manoeuvre that may have been available for the economical farmers is being progressively reduced (van der Ploeg, 2000; 509). In order to succeed, economical farmers and their institutional allies will need to develop and consolidate a ‘rural district’ or a ‘protected space’ able to stimulate the innovativeness and developmental trajectories of particular activities. “Only when such
protected spaces are created within the dominant ‘technological regime’ can the style of farming economically prosper and unfold further along the lines of rural development. The central question for rural development policies at supranational, national and regional level is whether or not they will contribute to the construction of such ‘protected spaces’ ” (van der Ploeg, 2000; 510).

Both endogenous and exogenous strategies “are examples of dependent development, although endogenous development strategies may provide rather more opportunities for locally-based social, economic and cultural circumstances to shape the development processes” (Slee, 1994). Van der Ploeg’s diagram suggests that endogenous development is linked to local communities and farming cultures (as the original emphasis of Hofstee’s concept of farming styles (1985) was on locality and culture), while exogenous is linked to formal and mainstream markets, science and agribusiness.  

Comparing the framework (Figure 3) with van der Ploeg’s diagram (1994) has helped to clarify its nature in understanding organic vegetable farming. Figure 3 is an interpretation of the dimensions relevant to the development of organic vegetable farming. The dimensions of the model (Figure 3) will be discussed further in Sections 2.2. and 2.3.

2.2 Use of Natural Resources

The right-hand margin of the ‘Ecological and sustained use of resources’ dimension emphasizes ecology, a word now popular in the social sciences (Bronfenbrenner, 1979; Lemke, 2000; Ueno, 2000) where it often refers to human interaction networks. Here the attempt is to refer to ‘ecology’ as the material or ‘nature’ part of farming activity. It is in ‘ecology’ that organic farming wants to distinguish itself from the rest of agriculture (Allen and Kovacs, 2000).

Organic agriculture as a movement is a sister, or at least a cousin, of environmentalist programs. Yrjö Haila and Richard Lewins (1992; 14-17) present some ideals or discursive features that are often present in the programs of environmentalist movements. In them, nature is a complex interlinked system in which biodiversity produces a harmonious whole. Every part and species of an ecological system has its specific function, which cannot be replaced by other parts or species. A balance is maintained through feedback networks and circulation of materials. Production can be sustained only if it is based on interaction between diverse organisms. Besides, since every ecosystem is unique, what works in one place may be disastrous somewhere else and knowledge needs to be produced locally. A goal for humans is to live in harmony and balance with nature. Haila and Lewins (1992, pages 18-23) show that these features do not derive from universal ecological theories, which themselves change and develop over time. For instance, we

8 Garud and Karnøe (2001) describe the concepts of ‘path dependence’ and ‘path creation’ in understanding entrepreneurship and novelty. It would be interesting to compare van der Ploeg’s concepts of ‘endogenous’ and ‘exogenous’ to them.
know that increased biodiversity does not necessarily lead to increased resilience and stability. The authors, although sympathizing with this, claim that the environmentalist movement program is human-made and has to stand on its own without trying to base itself on nature (Haila and Lewins, 1992; 17). Nature in itself can neither tell us what has to be done or be an immediate basis for societal programs.

‘Ecological and sustained use of resources’ (Figure 3) resembles the environmentalist program described by Haila and Levins (1992). However, I want to specify further the resource dimension of the framework (Figure 3), which reflects the choices available to organic vegetable farmers in their field management practices from a material and biological point of view. ‘Ecological and sustained use of resources’ applies and emphasizes some biological and ecological theories such as the ecological nitrogen cycle and maintenance of soil fertility which are significant to the goals of organic agriculture (IFOAM, 2003). These theories are also acknowledged in natural and agricultural sciences, but their importance in farming and contribution to sustainability is often debated (see e.g. Johnston, 1990; Grönroos and Seppälä, 2000). From the crop rotation planning sessions analyzed in this study, we can see that organic vegetable farmers also assess these biological theories by pondering on and testing green manuring and other organic techniques.

The horizontal dimension in Figure 3 represents the material and biological part of the farming activity, but it is biology mediated by a multitude of cultural and societal factors, such as conceptions typical of organic agriculture about how to understand biological phenomena, and through practices concerned with farming. In activity, pure ‘nature’ fades away by being interpreted and re-interpreted in various ways, until nature produces sudden and unexpected events. Examples of such natural phenomena are the strange disease or couch grass in the narratives in Section 1.3. This dimension tries to explore the dynamic struggles going on in organic vegetable farming practices concerning some theories related to ‘biology’ and ‘ecology’. The question of resource use is open and needs to be continuously defined and redefined in farming activity. A piece of material nature is not “one” but includes many functions and is able to surprise (this in no way makes research of the material unnecessary).

My understanding from this study is that it is useful in research to approach material things such as natural resources functionally, through activities. “…[M]an’s relation to nature as such cannot be fixed abstractly … it is not initially theoretical and reflective but practical and transforming” (Schmidt, 1971; 111).

In activity-theoretical terms, natural phenomena may enter an activity system as tools or objects of activity. Whether a certain material thing, a field for instance, is a tool or an object on a particular farm, needs to be discovered by analyzing the functional activity of that farm.
Marx Wartofsky (1979; 202) distinguishes between primary tools, such as fields, that are directly used in production, and secondary tools as representations. The latter are representations through which the use of primary artefacts, or forms of action, can be transmitted.

But the very production and reproduction of artifacts presents a made world as the symbol of what there is, and as a representation of the modes of praxis themselves. The tilled field, or the domesticated animal is no less an artifact in this sense than is the spear or bow or pot. Moreover, the very environment itself, as a space of action, is invested with the characteristics of an artifact. Nature becomes transformed, not only in the direct practical way of becoming cultivated, or shaped into objects of use, in the embodied artifacts we call tools, or in the ‘instruments’ of existence such as clothing, houses etc; it becomes transformed as an object or arena of action, so that the forest or the river itself becomes an ‘artifact’ in this ramified sense. It is a source of food, or of danger; it has a direction or is mapped into regions, it is endowed with familiar properties, or anthropomorphized in a representation of its uses, and of the modes of praxis appropriate to such uses (Wartofsky, 1979; 206).

One example of a representation is the principle of a balance between soil-consuming and soil-improving crops. Its aim is to maintain the soil fertility and, as this study shows, it is used in crop rotation planning in organic vegetable farming (article I; Seppänen, 1999a). When planning the crop rotation in 1998, the Kolas were expecting big onion sales to new customers, and wanted to increase the vegetable acreage. Large vegetable acreages not only satisfy the demand, but also give prestige to growers as entrepreneurs. The advisor opposed increasing vegetable acreage, not because it would be too exhausting for the farmers to work with or because they did not have enough machinery, but because she said it will be too heavy on the fields, too risky for soil fertility in the long run.9 The Alanens had larger fields. Unlike the Kolas, they did not extend the vegetable acreage because it would mean more work, and because it would be too heavy on the fields.

The same organic argument for a fertility-maintaining ‘balance’ appeared on both farms. This argument is interpreted here in terms of representation as a secondary artefact that mediates the planning of crop rotations. Another example of a representation is a five-year crop rotation plan, documented both on paper and electronically (Figures 5 and 6). These representations affect the way natural resources are used in organic farming; they are tools that configure its object and motive.

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9 Here, the analyses are not only based on talk. Spade diagnoses and yield levels showed that part of the Kola fields did have problems with soil structure (Seppänen, 1999b).
<table>
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<td>2.</td>
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<td>3.</td>
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<td>4.</td>
<td>vegetables</td>
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<td>5.</td>
<td>vegetables</td>
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<td>6.</td>
<td>perennial green manure</td>
<td>perennial green manure</td>
<td>vegetables</td>
<td>annual green manure</td>
<td>vegetables</td>
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</tbody>
</table>

**Figure 5. Representation of crop rotation the Kola farm (I) in the form of a table.**

1. Fallow and sowing of rye and grass  
2. Rye and sowing of clover  
3. Clover grass  
4. Clover grass and Chinese cabbage  
5. Potato  

**Figure 6. Representation of crop rotation from the Alanen farm (I) in the form of a crop sequence.**

The emphasis on the meaning of locality is another feature of the environmentalist program. It is also mentioned as a goal for organic agriculture in the form of using principally local and renewable natural resources (Rajala, 1995; 27). A philosopher, Hugh Lacey (2000), analyzing the texts of Miguel Altieri, found “local empowerment” an essential value-outlook in agroecology. In practical farming activity, the ideal of locality has to compete with the regulations of the EU that enhance potential for international trade (II, Figure 4, page 97; see also Section 2.4, Figure 10 of this thesis).

The question of the use of natural resources comes close to the study by Pernille Kaltoft (1999). She categorized values and organic farming practices by interviewing six farmers or farmer couples, distinguishing four paradigms of knowledge in organic farming: 1) nutrients, 2) soil fertility, 3) communication and 4) the biodynamic point of view seen as a paradigm. She defines a paradigm as ‘a coherent and a logical system of thoughts’. I will describe each of these separately.

The nutrient paradigm, basically conventional farming thinking, is gaining influence in organic farming (Kaltoft, 1999). One of its central issues is saving nutrients in order to increase yields as output. The soil fertility paradigm, which is traditional in organic farming, emphasizes the importance of humus and soil ecology to soil fertility. The biodynamic paradigm includes, beside soil ecology, supplementary phenomenological knowledge of nature. The communication paradigm is interesting but Kaltoft (1999) does not describe it in detail: it is an intermediary one because it can be combined with the soil fertility or biodynamic paradigms.
The dominant nutrient paradigm, which is easy to associate with technical education and to state as quantitative rules, views sustainable agriculture as a question of poisons (fertilizers and pesticides) or not. The other three paradigms support the idea of sustainable agriculture as a question of soil fertility and crop quality and presuppose awareness of different views of nature and value assumptions. According to Kaltoft, a struggle between two basically different understandings of sustainable agriculture is taking place. These understandings can be compared to the ‘input substitution’ and ‘system redesign’ concepts suggested by Miguel Altieri and Peter Rosset (1996); Rosset and Altieri, 1997, see article V). The idea of system redesign is to build diversified production systems according to the ecological model of nature, in which interactions among their components maintain important properties of the production system. Input substitution means the replacement of the chemical inputs of conventional agriculture by biological ones. According to Rosset and Altieri (1997), this tendency prevails in sustainable agriculture and organic farming. The way of thinking is based on symptom suppression that does not address the ecological reasons for sustainability problems.

The paradigms of knowledge discussed by Kaltoft inform this study. The nutrient paradigm is strongly evident in the organic inspection (III). The authors’ point of departure in the analysis, the challenge of temporal expansion and the corresponding quest for systemic management of field-related biological processes, can be considered as belonging to both the soil fertility and communication paradigms, which help distinguish the existing dominant nutrient paradigm in the data. But the categorization by Kaltoft does not reveal the diversity within the nutrient paradigm. The nutrient question can be linked to both plant growth and environmental concerns in the form of protecting water and water habitats (III, page 535). Juha Helenius (1998) separates these two by defining (agro-) ecological sustainability on the one hand as maintaining the agricultural resource base, such as energy, soil and its fertility, water and biodiversity and, on the other, as environmental conservation. Kaltoft’s (1999) nutrient paradigm seems to include or reflect both the technical production-factor discourse common in agronomic sciences as well as the discourse of environmental impacts. From the point of view of farming activity, they are very different. Seen in the light of the development of organic farming, the environmentalist tendency is new and increasing. Analyses in this study have revealed an increasing environmentalist protection tendency reshaping organic farming (III, V, see also Tovey, 1997). In any case, Kaltoft’s study opens up in a useful way the distinction made in article III between the powerful nutrient paradigm and the more ecological approach that can be defined as something in between soil fertility and communication in Kaltoft’s categorization. Also, Kaltoft’s nutrient paradigm helps show how the avoidance of nutrient leaching easily corresponds to the agronomic significance of nutrients in plant growth.

Noelle Aarts and Cees van Woerkum (1999) have studied patterns of communication between the government, agricultural sector and nature conservationists in the Netherlands. The core problem in this communication, they insist, is not the clash between different perceptions of nature, as often is claimed, but, more broadly, a clash between different cultures touching each other’s borders and therefore experiencing each other as threatening.
They define a culture as experiences, norms, practices, goals and interests. In line with these authors, this study also suggests that cultures are indeed crucial in object creation. When followed through material practices of farming, however, nature also has properties that are not always managed with cultures and perceptions of nature that are available in particular time and space (compare to the couch grass and the Chinese cabbage disease in Section 1.3).

This section shows soil fertility, or ‘maintenance of the resource base’, and environmental protection as historical layers in the use of natural resources in organic vegetable farming.

### 2.3 Societal Integration

Yrjö Engeström (1987; 156-7) argues that local work activities are becoming increasingly societal. This means that “activity systems are becoming gradually larger, more voluminous, and denser in their internal communication. Consequently, activity systems have an impact on growing numbers of people. Secondly, it means that different activity systems, and the people within them, become increasingly interdependent, forming ever more complex networks and hierarchies of interaction. Thirdly, this interdependency is not just a formal affiliation. Activity systems are increasingly penetrated and saturated by the basic socio-economic laws and by the corresponding contradictions of the given society.” As regards industrialized country agricultures, it is easy to agree about the increasing socio-economic relations in farming. However, more than any overall increase in interdependence, this study suggests a need for change in social and societal relations and for qualitative changes within relations in organic vegetable farming.

I will explain and illustrate this with the challenging relations in the in the Alanen farm narrative in Section 1.3. During crop rotation planning (January, 1998), Antti Alanen expressed his fear of disease risk in the production of Chinese cabbage. I was not so convinced that the diseases could not be anticipated, and I suggested Antti contact the person who, to my knowledge, was the most familiar with Chinese cabbage cultivation techniques in Finland. At first Antti hesitated. My interpretation is that the contact was difficult because of two significant ‘boundaries’ (Engeström et al, 1995; Kerosuo, 2001) between Alanen and the advisor. First, Antti was an organic agricultural farmer and the advisor belonged to the professional community of the conventional horticultural sector. The boundary between these two sectors is not insuperable, but is still significant. Agriculture and horticulture have been formed differently during their histories. Agriculture is general and has involved various political aims. The state has maintained agriculture. Horticulture as a sector is smaller and of another character, demanding high technical and entrepreneurial skills of growers. Being a small sector and the repertoire of horticultural crops being large, the advisory services for horticulture are spread around different organizations and regions. Above all, the new and developing organic way of farming makes it even more difficult to find suitable information on vegetable production.
There was no guarantee that the advisor would be able to give advice on organic production, or even be willing to help. The farmer just had to try.

Another challenging relation in the narrative is that between Antti Alanen and the buyer from the wholesale firm. Antti had promised to deliver a considerable amount of Chinese cabbage to a centralized Finnish food corporation. After the appearance of the strange disease in the storage, he was unable to fulfill his seriously-taken promise. Antti, being a member of the Board, played a double role. The question was not only about the reputation of the Alanen farm but of the farmer-owned marketing company as well. Normally farmers did not talk with the buyers when delivering the products through the marketing company. In this case, the company manager suggested that Antti should talk with the buyer himself and explain the situation. There was a considerable boundary to be crossed. Antti tried to explain that the disease made the sorting completely unprofitable, but this was not the right message for the buyer. He also learnt to formulate the problem in the right way for the wholesale firm: “I do not want to sell poor quality to you”.

How should we understand the challenge in this relation? First, it is possible that customer relationships in general are problematic. Vesala and Rantanen (1999; 79-80), by studying the entrepreneurial identity of farmers, argue that in selling (marketing) and in their relationship with customers, farmers have a negative attitude towards their own potential for influence. The problem might be in their situations as well, not only in their attitudes (Vesala and Rantanen, 1999; 81). As article II showed, clients were not a learning challenge on the Kola or Alanen farms. This finding was understood to mean that farmers call customers those people whom they have a direct relationship with and, once they have such relationships, the initial problem of the lack of customer-orientedness has already been overcome. While this might be somewhat simplifying, it does indicate the importance of the process of getting to know and interacting with the people as actual or potential customers.

I interpret the boundary as due to the business-life culture of the central corporation that differed from the farmer culture of the Alanens. Although the Alanens clearly had a history in peasant culture which influenced the present, labeling the Alanen farm a peasant one would not do justice to its dynamic farming activity. The disease problem was converted into a problem of how to communicate this to the buyer, and how to negotiate about further actions. Using the interpretation of the finding in article II about customer relations, the marketing company did not help the relationship between corporations and farmers by not making them communicate directly with each other in normal conditions, and thus let the face-to-face, or voice-to-voice, customer relation be established. In this sense, the

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10 Challenge here is understood as related to crossing the existing boundary. The boundary is understood as an important one through the activity-theoretical interpretation of the history of Finnish agriculture (see footnote 6 in Section 2.1).

11 Culture can be considered as what a person has to know in order to act appropriately in the eyes of its members (Emerson, 2001; 296). Here, culture emphasizes the different object constructions within and between activities.
manager’s decision to let Antti Alanen talk directly with the buyer was new and innovative.

One of the learning challenges encountered in societal integration was subsidies (II, Table 4). The regulation in each of the subsidy programs, such as the Common Agricultural Policy and the agri-environmental scheme, are based on their own logic. Farmers have to coordinate all these regulations in their farming activity. For the Kolas this meant many open questions and uncertainty about what they were allowed to do in their fields. In spring 1998, the Kolas participated in an educational event about the subsidy schemes organized for farmers by administrators. In addition, many phone calls had to be made to local and regional agricultural offices during spring and summer. Despite all this, uncertainty remained as to what was allowed or forbidden (IV, pages 171-172). The formal requirements forced the farmers to expand their object towards administrative agencies, rules and subsidies.

In all these relations, the challenge for organic vegetable farming means crossing multiple cultural boundaries. I see creating possibilities for mutual information exchange and common negotiation as directly as possible as an opportunity to go forward with these challenges. This happens simply by people meeting and talking to each other, by telephone, fax and invoicing messages, etc. To my understanding, this continuous boundary crossing offers opportunities for farmers, conventional advisors, buyers and administrators to learn.

Section 2.1 introduced us to the ‘farming styles’ concept of van der Ploeg (1990, 1994). Going back to its origins (Hofstee, 1985, ref. van der Ploeg, 1994; 17) reveals that exogenous development is linked to commercialization and commoditization, agribusiness and the administrative task-environment, while endogenous development benefits relations within the local agricultural culture and community. From the point of view of this study, the main challenge of societal integration is neither of these, but rather to create new types of dialogical relations that partly stem from local cultures and communities, and partly from other institutions and businesses.

Bohler and Hildenbrandt (1990) offer an interesting account on historical developments of four different farm family cases, analyzing the agricultural action using a four-level social structure:
1. The general Western rationalization process with its specific direction and the general structure of society and development of the economy.
2. The particular features of the region and the agricultural landscape with regard to that natural and economic area, the local social structure and traditional patterns.
3. The history of the farm, the actual farm organization, the family and its particular life history.
4. The subjective action orientation within the structural framework and against the background of individual life history and education.
Levels 1 and 4 correspond to a society orientation that typically characterizes European development in history, while levels 2 and 3 correspond to community orientation (Bohler and Hildenbrandt, 1990; 19). The authors show how different levels (1-4) predominate in different families. Mikko Kumpulainen’s (1999; 101) study of relations with nature of Finnish farms has used the structuring levels of Bohler and Hildenbrandt (1990), modifying it and depicting it graphically (Figure 7).

Figure 7. Agriculture in a four-level social structure (Kumpulainen, 1999; 101, adopted from Bohler and Hildenbrandt, 1990). The bar crossing the circles is the nature relation. Kumpulainen (1999) has divided “the general Western rationalization process” into two levels.

The advantage of Bohler and Hildenbrandt’s levels is that the local and the global, or societal, are distinguished. The region (level 2 of Bohler and Hildenbrandt, 1990), or the boundary between regions, seems partly to explain the boundary between Antti Alanen and the horticultural advisor. The central corporation buyer may indeed introduce “the general Western rationalization process” (level 1 of Bohler and Hildenbrandt) into organic vegetable farming, but otherwise the levels of social structure seem not to be very useful in analyzing the two relations of the Alanen farm. Neither these relations nor the cultural boundaries they represent fall into these categories12. The levels describe the environment for agricultural action as given and static, while the interactions of the Alanen narrative are initially open and dynamic. The challenge of societal integration of organic vegetable farming cannot be ascribed to any one of Bohler and Hildenbrandt’s (1990) social levels. From the point of the Kola and Alanen farms, a dialogue and dynamic change describes the evolution of their relations better than the one-way integration of these farms into given social and societal circumstances.

12 In fact the Bohler and Hildenbrandt’s (1990) analysis interpreted actions of individuals as showing performances at other levels.
Figure 8 shows in a sketchy way the relations of the Alanen farm that were talked about during crop rotation planning in winter 1998. Figure 8 was an intermediate tool used in analyzing crop rotation planning discussions for article II. The triangle in the middle is the Alanen farm. The figure shows the multitude and variety of contacts and the way they are linked to the farm, apparently highlighting more the reciprocal nature of the social and societal relations than Bohler and Hildenbrandt’s (1990) and Kumpulainen’s (1999) Figure 7.

Figure 8 shows the local level, but where is the societal or global level? It is assumed that these are embedded within the local. The levels are not understood in terms of spatial scale, but in terms of the hierarchy between actions, practices and activity (see Sections 1.2 and 3.2), and the network in Figure 8 can be understood at any of them. ‘Societal’ is defined as the totality of human relations which are here to be understood quite literally (II, page 88). Figure 8 partly explains that ‘societal integration’ means interpersonal relations (individuals, groups of people, organizations, institutions, etc.) together with the public, universal and social knowledge they mediate. The main categorization used was

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The network view presented here has similarity to the idea of actor-network theory in which social worlds remain flat at all points (Latour, 1996; 240).
administration, subsidies, customers, demand, other farmers, and extension, education and research (II, Tables 2 and 3).

While these categories as such do not reveal much about the developmental potential of organic vegetable farming, there is a need for re-interpretation. Is there some other way of identifying essential relations? I approach this question from the point of view of the Kola farm, in summer 1998 (IV) with its couch grass problem. Material and social aspects are intertwined in object construction, and weeds are a way in which the object ‘hits back’ or resists human farming activity (Miettinen, 1999). The technical challenge of natural resource use is also a social challenge (VI, page 137).

We have to take into account that the Kolas did not consider weeds as a significant problem during planning in winter and spring. The quantity and the seriousness of the couch grass became apparent in the summer. Despite expectations, organic inspection during the summer did not help (III). What social relations could have helped the Kolas with this problem? The following scenario is plausible.

First, advisory services for organic farming would have been a potentially helpful contact. Second, farmer cooperation could possibly teach the Kolas the basics of tillage and other field work from the point of view of controlling couch grass. During summer 1998, the Kolas had started close collaboration with another farming couple with an agricultural history who had recently converted to organic. The cultural boundary between agricultural farmers and horticultural entrepreneurs between the farmer families perhaps positioned the Kolas as advising the other couple in cultivation techniques, and not the other way round. Relations with other farmers and advisors would have been helpful for the Kolas in resolving the couch grass problem. These could be called ‘organic relations’ because they support and enhance learning of organic farming techniques. Organic inspection of the Alanen farm with a lot of advisory talk in system redesign (V, Figure 2, page 8) shows that ‘organic relations’ can also be built between farmers and administrative inspectors.

Many of the links in Figure 8 are indispensable, or at least improve the performance of organic vegetable farming. If the realities of the farms have dependencies, how then should we understand the “independence and self-sufficiency” side of the societal dimension (Figure 3, Section 2.1)? It is to be understood in terms of the actions of farming. Dependencies do not exclude alternative answers to questions such as whether we plant the onion ourselves or hire a contract machine, raise the seedlings on the farm or buy them (Seppänen, 2000), or cooperate in marketing with other farmers or not (II). Not even previously chosen strategies prevent these questions and other similar ones being considered and reconsidered time and again in on-farm activities. It seems that no matter how well socially and societally integrated you are, the option of independence and creation of new dependencies remains.
2.4 Interrelation between the Societal and the Use of Natural Resources

Juha Helenius (1998; 6), describing the sustainable development of agriculture, argues that the “[s]olution to the anthropocentric/ecocentric rope-pulling is offered through understanding the foundational nature of [nature-] environment without which there would be no society nor economy.” The environment-society relationship here can be interpreted in at least two different ways, both of which are systemic. The first is to see nature as that which society and economy base themselves on. In more general terms, nature, or the ecology, forms the limits or a container within which human activities are able to take place. In the second interpretation, nature and society arise together as part of a single biosocial-cultural process. Michael Cole (1996) refers to this process as ‘context which weaves together’ as compared to ‘context that surrounds’. “The boundaries between ‘task and its context’ are not clear-cut and static but ambiguous and dynamic. As a general rule, that which is taken as object and that which is taken as that-which-surrounds-the-object are constituted by the very act of naming them” (Cole, 1996; 135). The metaphor is not an object within a box but a rope which is constituted of fibers twisted together. The processual nature of activity becomes understandable as a continuous rope in which material, social and cultural fibers, as moments in a single process, form it together. The fibers may not be continuous, but the rope is.

The ‘context which surrounds’ metaphor can be visualized as a box within boxes or, as in Kumpulainen’s Figure 7 (Section 2.3), a circle within circles. As I understand it, it does not clarify the movement from level to level or the quality of the relationship: only telling us what the ‘bigger’ or ‘broader’ context is. Beside the rope, another metaphor for the ‘context as that which weaves together’ is a network (Figure 8), which offers potential for breaking the dichotomy between endogenous and exogenous (see Section 2.1. of this thesis) by being able to show the functional relations between the units. The notion of expansion, or expansive learning which transcends the given context (Engeström, 1987; 5) will be discussed in the following section.

We have now explained the dimensions of the framework, and can thus present it in a more detailed but still concise form (Figure 9).
I will give two examples of how the framework (Figures 3 and 9) has been used to analyze the intertwining of the societal and the use of natural resources in actions and practices (II, Figures 3 and 4, pages 96 and 97). During crop rotation planning, the question of where to obtain additional nutrients for the crops was discussed. Previously, the Kolas had bought slurry and manure for their compost from the neighboring farms. Now they had a new choice of fertilizer, a biological product from Austria that had been accepted as organic fertilizer in the EU. Both of these choices were discussed.

In this example, the dimension of the use of natural resources acquires its meaning as local vs. non-local resources. The dimension of societal integration opens up the alternative links or channels from where nutrients can be obtained. Since the Kolas were not...
interested in the local composts and manures (which were bought commercially in cash and not in manure-fodder exchange), this choice is placed down towards the ‘non-dependence’ edge of the dimension of societal integration. Since the Biosol fertilizer was viewed positively and as the establishment of a new relation, this topic was placed up. In terms of locality, Biosol is on the left (non-local) while composts and manures are on the right (local). All this is interpreted in the context of the development of the Kola farm. It was originally a horticultural enterprise, very used to having commercial relationships with other enterprises. Figure 10 suggests that the Biosol choice was easy for the Kolas because it would continue the type of relationship they had previously. Farmer cooperation, necessary in the acquisition of local fertilizers, was more difficult and challenging for them.

Another example is the avoidance of nutrient leaching, which was dealt with in crop rotation planning of both farms, but in different ways. The Alanen farmer expressed his interest in knowing how much nutrient would seep into the groundwater from his fields. On the Kola farm, although restrictive, the question of a winter coverage requirement (as a legal means of avoiding nutrient leaching) was very well observed in crop rotation planning. Because the positive and influential role of this issue in the data of both farms, it is interpreted as on the right and up in the framework of the study (see Figure 11 below). What differentiates the farms in these topics is the quality of societal integration. For the Kolas, there was an administrative rule to be followed. For the Alanens, the interest in groundwater quality was a farmer initiative, expressed at a meeting of educators and extensionists.

Figure 11. Issues of nutrient leaching and the winter coverage requirement of the Kola and Alanen farms, interpreted in the framework of the study.
2.5 Learning

Within the European tradition of Farming and Rural Systems Research and Extension, there has been an ongoing discussion about learning and knowing processes for change. This discussion in the LEARN Group represents and applies a wide range of theories of learning (Cerf, et al., 2000). Ray Ison, Chris High, Chris Blackmore and Marianne Cerf (2000) explore various theoretical frameworks for learning-based approaches, mainly from their perspective of systems thinking and second-order cybernetics. Their exploration is intended to increase awareness and the repertoire of available choices for stakeholders in agricultural research and development. As in this study, the authors follow a processual view of learning rather than learning understood as ‘knowledge acquired by study’ (ibid; 37).

Ison et al. (2000) distinguish between ‘social learning perspectives’, ‘situated learning theories’, and ‘epistemic learning’. A widely applied and pragmatic concept of social learning, based on many theoretical traditions which in general emphasize participation and collaborative problem solving, is used in several domains. A feature of situated learning theories, according to Ison et al, (200; 39), is that “engagement in a human activity is already learning, it is not necessary to transform this experience into ‘knowledge’ for it to be recognized as learning.” Drawing on Salner (1986), Ison et al. (2000) define epistemic learning as involving the deliberate breaking down and restructuring of mental models that support world-views. This implies for the learner going “through a period of chaos, confusion and being overwhelmed by complexity before new conceptual information brings about a spontaneous restructuring of mental models at a higher level of complexity, thereby allowing a learner to understand concepts that were formerly opaque.” This represents a difficult task for facilitators and curriculum developers in terms of theoretical competence, and because learners are members of ‘learning systems’ such as families and firms (Ison et al., 2000; 39).

This study shares the view of Ison et al. (2000) of the importance of increasing the awareness of stakeholders in agricultural research and development, and “of broadening the repertoire of choices for purposeful action available” (Ison et al., 2000; 32). In the following, I point out some differences between various learning perspectives presented by them and this study. The aim is to identify features of the learning conception of the present study and I do not do full justice to the approaches they describe.

The social learning perspective is represented in many theories of learning in some form or another. In this study, activities are collective and therefore directly or indirectly social (Section 1.2.). The crop rotation planning discussions and organic inspections analyzed here provide social interactions in which learning is possible and can be studied, but learning in this study is not, in the strict sense of the word, purely social. For instance, the material fields and documents play a crucial role in organic inspections (III and V).
Chaos and confusion are needed in epistemic learning conceived as involving breaking down and restructuring the mental models of the learners. From the point of view of this study, a researcher or facilitator does not have to create chaos and confusion, since there is much of both in the everyday lives of farmers and other practitioners. To my mind, the ‘problematique’ of agriculture in industrialized countries (Hubert et al.; 2000), or whatever practical domain is concerned, needs to be involved when we create, modify or apply theories of learning.\footnote{Although it was not clearly stated in their article, Ison et al. (2000) may agree on this.} The content of learning is inseparable from people’s every-day activities and practices. People are learning because they face challenges and solve problems vital to their activity (Toiviainen, 2003; 47). For the same reason, concepts and models of a universal learning theory are not necessarily the best ones in understanding and promoting change in practices of a particular domain. From the point of view of this study, there is a need for theorizing and continuously creating and re-creating concepts or models for local needs. Figure 3 is such an attempt.

Cecilia Waldenström (2001) studied the interaction between Swedish agricultural advisors and farmers. Her main interest was in the shared contexts that are jointly constructed in interaction and that mediate the communication. The empirical questions were: 1. How are shared contexts constructed in the farmer-advisor interaction? and 2. What seems to be important in such shared contexts? Her social constructivist study is theoretically based on contextual didactics, Gibson’s (1979) concept of affordances, dialogical perspectives of talk-in-interaction (Linell, 1998), and Habermas’s theory of communicative action.

Waldenström conceives of the farmer-adviser interaction and the construction of shared contexts as taking place in a particular kind of ‘dialogical space’ where possibilities may be explored and understandings and actions questioned and reflected on. “In dialogical space, utterances gain particular significance because they are interpreted against the background of a particular communicatively constructed and shared context. In this construction, the participants draw on different ‘contextual resources’ (ibid., 165-166) which include, for instance, the negotiated understanding of what and how the advisory service can contribute to the farmer’s production, the reality of the unique farm, a joint narrative of production, and the “farming project”, which is Waldenström’s term for the meaning, ends and various values farmers attribute to their farming (ibid., 133). The study illustrates the importance of the surrounding physical world and task-orientedness for the construction of the dialogical space.

Waldenström (2001) considers learning as a dialogue where activities (as defined in this study) offer ‘contextual resources’ for this dialogical space. The focus of this study is different. Practices and discussions are analyzed in the context of activity, and learning is defined in the interplay between these levels. For Waldenstöm, the material world and the farming project are indeed included in learning as offering resources, but they are not considered as the content and the object of learning, as in this study.
According to Engeström (1987; 91), quoting Leont’ev (1978), learning is related to reflecting the motive of a given, concrete activity to the motive of a wider activity. “To gain mastery of the whole work activity means to move from actions to activity… the expansive form of this transition implies that the actions themselves are objectively transformed.” “The subjects must become aware of the contradictory nature of their present work activity and relate it to a future form of the work activity that realizes a broader, more general life relation that includes the given, concrete activity (meaning that the given form of work is not eliminated or replaced at once)” (Engeström, 1987; 114). There are two requirements for learning: the movement between actions and activity, and encountering the internal contradictoriness of the learning tasks.

This study draws on learning as a movement between individual actions and the collective activity suggested by Engeström (1987) (methodologically, this principle has been used in all the articles; see especially VI). Engeström gives two keys for learning: reflection and the objective transformation of actions. Objects of activities (Sections 1.2, 3.2; I, II, IV, VI) are followed in this study in order to grasp processes of learning as actual or potential changes in actions. Actions cannot be understood without activities that give them context.

Engeström (1987) draws on Gregory Bateson (1972) in theorizing learning. Bateson’s Learning III is one source of Engeström’s concept of the expansive cycle (Engeström, 1987; 1999; see its modification in article II, Figure 1, page 89). The expansive cycle is a long-lasting developmental process that contains both internalization and externalization (Engeström, 1999; 33). The direction of development needs to be decided on and negotiated locally. Vygotsky’s concept of the zone of proximal development (1978) is re-interpreted and used to describe the open but not arbitrary ‘field’ of uncertainty and intensive search, while the zone of proximal development is the distance between present actions and the historically new form of activity that can be collectively generated as a solution to contradictions manifest in everyday actions (Engeström, 1987; 174). Since expansion is a qualitative transformation and reorganization of the object (IV, page 181), expansive learning not only means awareness of available choices, but also construction or reformulation of new choices, practices and activities. It is not only human construction that is at stake in expansion, but also the expansive self-movement of the object that creates the need for expansion for the people who work with the object, which is risky and complex. Expansion always includes both social and material dimensions.

In this study, the concept of a learning challenge means, first, something that can be observed as problematic in the everyday lives of practitioners. Learning challenges in farming require that every-day problems be theoretically interpreted in the light of historical contradictions of the farming activity. Not all problems of every-day life are learning challenges: they are produced by historically formed contradictions within an activity or between activities. A learning challenge also implies that a preferable way forward is emerging, which in other words means that a zone of proximal development needs to be formed (VI). Learning challenges can occur at many levels of activity (see Figure 1, Section 1.2) and can be expressed by many types of vocabularies. Not all every-
day problems in the farming activity are necessarily learning challenges, as the actors might not always be aware of them. A learning challenge means that there is a boundary that needs to be crossed (III). A methodology for analyzing learning challenges is described in Section 3.3 (see also II, pages 91-93).

Let us consider the example of fertilizers described in Section 2.4, Figure 10. It shows a tension between the general level of organic vegetable farming activity where local use of resources (such as nutrients) are emphasized, and the level of actions of the Kolas, who are willing to buy nutrients from abroad. The given level of a general activity suggests that local farmer cooperation in nutrients is a learning challenge for the Kola farm. Still, the tension between these levels remains an open zone. With time, the aim for locality can either be strengthened in organic agriculture, or changed, or can become an ideal that exists only in wishful thinking, having no meaning in practical farming actions. In the two latter cases, the framework (Figure 10) would need to be changed.

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15 Wartofsky (1979; 208) describes this type of representations as tertiary artefacts. “…we may speak of a class of artifacts which can come to constitute a relatively autonomous ‘world’, in which the rules, conventions and outcomes no longer appear directly practical, or which, indeed, seem to constitute an arena of non-practical, or ‘free’ play or game activity. This is particularly true when the conventions of representation – e.g. in art, or in language – become transparent, i.e. when the relation to direct productive or communicative praxis is so weakened, that the formal structures of the representation are taken in their own right as primary, and are abstracted from their use in productive praxis.” It would be interesting to study the relationships between tertiary, secondary and primary artefacts in organic farming.
3 The Research Process

3.1 Research Problems

The aims of the study (Section 1.1) have produced the following research problems, which form a sequence in the study of learning and relevant developmental problems in organic vegetable farming.

1. *What are the relevant dimensions of object construction in organic vegetable farming?*

The first aim set was to study change and learning processes in the activity of organic vegetable farming. Before going to the questions of change and learning, it is necessary to ask what the relevant concepts or dimensions along which change and learning in organic vegetable farming should be looked at are. The concept of the object and its construction offer means to go forward with this task. By revealing the relevant dimensions of the object construction in organic farming, this research problem lays the ground for later research problems. The dimensions are both subjective and objective, and enable us to analyze activities of farms that come to organic farming from different histories.

2. *What are the developmental contradictions and learning challenges in organic vegetable farming?*

In activity theory, contradictions are seen as fruitful resources for learning and development. This research problem discovers contradictions that exist within and between the dimensions suggested in the first research problem. The contradictions of the object are a step in analyzing and highlighting existing learning challenges.

3. *What do the contradictions and learning challenges suggest about the zone of proximal development of organic vegetable farming?*

The zone of proximal development concept suggests directions in which to develop the farming activity. It also explains what is considered as learning. Here the framework (Figure 3, Section 2.1) is an outline of the zone of proximal development of organic vegetable farming.
4. What reflective tools may be used to deal with the developmental contradictions and learning challenges?

Moving at the zone of proximal development is not always easy, because risks and uncertainties are involved in trying and implementing new practices and ways of working. Two types of tool, or instrument, are at stake here. The first is those with the potential to enhance moving in the desired direction. The second type is those that help reflect on the dynamics of activities and how they are related to local and particular actions and practices.

These research problems are presented as research questions in more detail in the articles. Figure 12 illustrates the relationship between research problems and questions.

Research problems:

1. What are the relevant dimensions of object construction?
2. What are the developmental contradictions and learning challenges?
3. What do the contradictions and learning challenges suggest about the zone of proximal development?
4. What reflective tools may be used to deal with the developmental contradictions and learning challenges?

The research questions of the articles:

Article I
What kinds of object construction are there in organic vegetable farming?

Article II
What are the learning challenges in societal integration?

Article III
How is ‘farming across the years’ present in organic inspections?

Article IV
How does the object expand and how is it managed?

Article V
How do inspection practices (compliance and advice) relate to different definitions of organic?

Article VI
What tools may be used to analyze and discuss farmers’ learning challenges?

Figure 12. Relations between research problems and the research questions of the articles.

Research problems relate to many research questions in the articles, but not all. All articles (I-VI) contribute to the first research problem by explicating the dimensions in object construction in different ways. The problem of learning challenges is particularly important in article II, while articles V and VI contribute mostly to research problems 3 and 4.

The research problems will be resolved in Section 4.1.
3.2 Methodology and Data

The empirical study centers around longitudinal ethnographic field research (Emerson, 2001) on two farms, mainly for two reasons. First, activities are carried out by human beings as insiders of an activity, and the point of view of the subjects or actors who participate in and realize the activity need to be considered. We have to go into the specific learning actions of the participants in order to understand the dynamics of learning, which often takes time. Second, farming as an activity is indeed very broad. It is bound to the calendar year, and its actions vary greatly from season to season. Both of these reasons suggest a concentrated study of a few cases for a lengthy period of time.

Figure 13 shows the levels (operations, actions, practices and the particular and general activity) of this study, and how they are related to the methodology. The first link between the levels is the transition from levels observable on the farms as operations, actions and practices of and between individuals, and that of the particular farming activity of the two farms in the study. The second link is between the particular activity of a farm as an activity system, and the general, historical development of organic vegetable farming.

![Figure 13. Levels of activity related to the levels of analysis of this study (see also Section 1.2).](image-url)
Managing the two links between the levels of analysis was based on several steps. First, ethnographical fieldwork was carried out on the Kola and Alanen farms. Second, the histories of the farms were investigated through interviews, interpreted using the activity system model (see VI, Figures 1, 2 and 3) and the expansive learning cycle (see II, Figure 2, page 89). Third, the general histories of organic farming and that of Finnish agriculture were studied. Fourth, suitable methods of systematic qualitative data analysis based on previous steps were created. Fifth, audiotaped crop rotation planning data and videotaped data on organic inspections were analyzed and reported in the articles.

The first link (between the actions and utterances of individual actors, and farms as activity systems, see Figure 13) was established by interpreting utterances, actions and problems in the context of the activity systems of the farms. The second link was managed by relating the particular activity systems of the Alanen and Kola farms to the general histories of organic farming and Finnish agriculture. The core principle in making these linkages was to look for suitable concepts and expressions that would reveal the similarity of phenomena at different levels. As an example of this, see the contradictions in Table 2, Section 4.1, and their corresponding objectivations in the dimensions of the framework, Figure 3, Section 2.1.

The ethnographical work and the theoretically interpreted general and particular histories produced working hypotheses about the contradictions. Despite being partly based on the empirical work, the working hypotheses are of a general kind, and the way they are manifested and resolved in two different farms as activity systems was investigated. On the other hand, how the working hypotheses are manifested and resolved in the situated practices of crop rotation planning and organic inspections was analyzed. The working hypotheses were partly changed or further developed using the qualitative analyses.

The basis for the ethnographic study was the documents and reports produced during the previous project (Participatory development of organic vegetable farms; see Seppänen, et al., 2000). My fieldwork for the present study consisted of more than ten visits per year and various telephone calls to both farms over two years (1997-1998), which included participant observation of various farming practices, interviews with the farmers, hired workers and others, as well as interventions. During busy summer seasons, the shadowing technique (Reder, 1993) was used. A field report was written about each farm visit.

The historical account written by Katajamäki and Kaikkonen (1991) was important in the study of Finnish agriculture in general. Interviews of administrators, advisors and researchers were also used. The history was looked at from the perspective of how it could help in understanding the development of the farms, their situated practices and actions. As a general overview, the methodology has proceeded as a dialogue and continuous shifting between the three levels (Figure 13). The ethnographic study, historical accounts, interviews and interventions contributed to the formation of the working hypotheses.
The systematic qualitative analyses were made from audiotaped crop rotation planning sessions (I, II) and videotaped organic inspections (III and V). These offer windows where organic vegetable farming is discussed and reflected on in a broad perspective, and through which it is looked at.

Theoretically, these data are analyzed using two complementary units of analysis. On the one hand, they have been conceived of as strategically important practices of organic vegetable farming in which farming activities are performed and reflected upon in broad terms with advisors and inspectors. The darkened circles showing practices of crop rotation planning and organic inspection (Figure 1, Section 1.2) indicate this. Simultaneously they are closer to the activity level because many crucial practices, problems and opportunities of the whole activity are reflected on and discussed in them. Since talk and discussion in these meetings form part of the activity of organic vegetable farming, planning discussions were analyzed in this sense in articles I and II, and the findings were generalized to organic vegetable farming.

On the other hand, the focus in these practices has been the joint interaction between the farmer, inspector and fields/documents. Here, the practice is understood as construction of a partially shared object for the interacting activity systems of farming and inspection (III, IV, V; see Figure 14 below). Generalization is made to on-farm inspection practices (III, V). Beside being practices of broad observation of the farming activity, crop rotation planning sessions and organic inspections provide comparative settings for research. They are also general: all organic farms are inspected once a year, and crop rotations are repeatedly planned between advisors and farmers.

*Figure 14.* The theoretical unit of analysis as interaction between the two activity systems of farming and inspection (III, IV, V).
Essentially, the object of organic vegetable farming is the process of making ‘raw materials’ into products and selling them to customers. The land, crops and the customers are part of the object. The use of the concept of object in this study is an attempt to examine the relation between the material natural resources and the social and societal relations in the empirical analysis of the formation of this farming activity. The concept of the object is by nature multifaceted.

...[S]triving to understand an evolving object in all its complexity requires careful study of an activity system over time, from several perspectives and ideally through several kinds of data. Although object conceptions can be observed and identified empirically, the object – engaged and enacted yet always unfinished, simultaneously material and ideal – is in its essence “uncatchable”. Perhaps the most illuminating questions a researcher in pursuit of object understanding can ask are toward what is the collective activity oriented, and what is energizing it? The “catches” in the form of manifested object-concepts, though partial and transitory, is worth the pursuit.” (Foot, 2002; 148).

3.3 Methods of Data Analysis

Data analysis started by listening to and watching the data, and later reading it in a transcribed form. Additional interviews were conducted for better understanding. For example, video excerpts of organic inspections were shown to inspectors, who were asked to say what was happening in them (stimulated recall, Engeström, 1995; 140). Literature, seminars and discussions with various actors in the field of organic agriculture, as well as documents and other artefacts, served as resources for interpreting the data. My knowledge of organic farming techniques has also helped the interpretation. The theoretical framework (Figures 2, 3 and 4, Section 2.1.) guided the analysis.

I will now briefly describe the methods that were used in the qualitative analyses in answering the research questions and problems. The methods were created in the course of the study, and the data, key concepts and methods used are listed in Table 1. The articles contain more detailed descriptions of the methods.

In examining object construction in organic vegetable farming, the framework for the analysis was outlined from the history of sustainable and organic farming, and that of Finnish agriculture (I; Figure 2 in Section 2.1). The concept of ‘idea’ was used to identify those excerpts from the crop rotation planning data which contained talk about either “entrepreneurship and customer-orientedness” or “sustainability in resource use”. The empirical unit of analysis, or unit of observation, was the turns of talk dealing with the ‘idea’. The directions in which the ideas were moving in the discussion along the dimensions of the framework were interpreted, the findings being depicted as arrows in the framework (I, Figures 2 and 3, pages 288 and 290). Conclusions about the developmental contradictions were drawn from the findings.
Investigation of learning challenges was done by the following method. The data was classified twice, first by five types of expressed need, and then by the multiple types of links, or relations, in societal integration. The types of expressed need (questions, intentions, problems, dilemmas (Billig et al, 1988), and disagreements) in particular were detected in order to find and examine something that would empirically indicate learning challenges. Empirical units of ‘hybrid topics’ of differing length were created for further analysis by cross-tabulating or combining the topics with expressed need with those with links. The main method in finding the potential learning challenges empirically was to find those links in relation to which the instances of tension arise. This happened if the same links both potentiated and restricted the farming activity. Thus, the concepts of dilemma and hesitation have been essential in detecting instances of tension in the data. The systematic analysis of links and tension produced new information and the historical working hypotheses used were partly reconsidered and changed (II).

The temporal aspect of learning organic farming as a learning challenge was analyzed by two methodical strategies. The first strategy was to make a categorization of videotaped inspection data of the Kola farm (III, IV). A turn of talk is the empirical unit of analysis, meaning an utterance expressed by a person, which is preceded and followed by talk from other people in the discussion in most cases (III, page 530). Data were categorized into two different types depending on whether the temporal boundary was crossed in the discussion data or not. In the ‘now’ or ‘ongoing’ type of data, the issues were discussed and referred to as within the limits of the ongoing growing season. In the ‘speech across the years’ type, something that happened in the past or was planned or expected to happen in the future was talked about. Later, the speech across the years was divided into three subcategories: 1. turns including a link with the ongoing growing season, 2. turns with no link to the present situation, and 3. turns that did not deal with field management issues. The types of data were presented according to the geographical sites of the farm and inspected fields in which the discussion took place (III, Table 1, page 531; IV, Table 7.4, page 170). Later, with an example of each type and subcategory, the context of these sites as ‘field visits’, that is, the field conditions, crops and the documents used were considered in interpreting the use of ‘speech across the years’ in the inspection (III). These analyses revealed other boundaries that also need to be faced when crossing the temporal boundary.

The other strategy employs the concept of expansion in describing and analyzing the temporal and socio-spatial aspects of the object transformation in organic vegetable farming (IV). A trajectory of several months is followed through the collaborative creation and implementation of a new crop rotation plan. Special attention is paid to socio-spatial and temporal expansion and to emerging new instruments that support the construction of the new object.

The question of how inspection practices may affect organic farming and its development was approached by the following method. Compliance and advice as categories of inspection discussion were systematically distinguished. Within the use of natural
resources, concepts of ‘input substitution’ and ‘system redesign’\textsuperscript{16} were employed as different definitions of organic. These concepts were applied to analyze the practices and techniques of field management, discussed during organic inspections (V). A ‘field visit’ was shown in order to illustrate a merging of compliance and advice. It was described how crop rotation, taken as a core example of system redesign, was dealt with in inspection discussions.

The approach of developmental work research was applied in order to show how visual learning tools were created (VI). Beside activity theoretical concepts presented in Sections 1.2 and 3.2, the concept of disturbance was employed. The difference and connection between activity and actions was exemplified by the concepts ‘contradiction’ and ‘disturbance’, and ‘new form of activity’ and ‘solution’ (VI, Figure 7, page 142). Temporal trajectories of creating and discussing the learning tools with the farmers are presented by using ethnographic field notes as data.

\textit{Table 1. Data, key concepts and methods.}

In articles III and IV, data from the horticultural Kola farm were used. In other articles, data from both farms were analyzed.

<table>
<thead>
<tr>
<th>Data</th>
<th>Key concepts</th>
<th>Methods</th>
</tr>
</thead>
<tbody>
<tr>
<td>Audiotaped crop rotation planning discussions; documents</td>
<td>Object; crop rotation; entrepreneurship and customer-orientedness; sustainability in resource use.</td>
<td>How an idea related to customer-orientedness and/or sustainability in resource use moves within the theoretical framework.</td>
</tr>
<tr>
<td>Audiotaped crop rotation planning discussions, book-keeping data from the farms</td>
<td>Learning challenge; working hypothesis; societal integration.</td>
<td>Topics with expressed needs and links were examined in order to find those links in relation to which instances of tension arise.</td>
</tr>
<tr>
<td>Videotaped inspection of the horticultural farm and related documents</td>
<td>Farming across the years; learning; boundary</td>
<td>The crossing of the temporal boundary and speech across the years types were examined, and the types were interpreted in the context of \textit{field visits}.</td>
</tr>
<tr>
<td>Various (in the farming part: audiotaped crop rotation planning discussion and its instruments, videotaped inspection and its documents, observation)</td>
<td>Object; expansion; compression</td>
<td>A trajectory of crop rotation planning and implementation is followed. Attention is paid to \textit{socio-spatial and temporal expansion} of the object and its new \textit{instrumentality}.</td>
</tr>
<tr>
<td>Videotaped organic inspections and related documents, interviews with inspectors and other administrative officials</td>
<td>Definitions of organic agriculture; inspection practices</td>
<td>Analysis of how \textit{compliance} and \textit{advice} interplay with \textit{input substitution} and \textit{system redesign}.</td>
</tr>
<tr>
<td>Ethnographic observation and interviews, data on yield levels and field conditions of the farms</td>
<td>Learning tool; activity; actions</td>
<td>Elaborates how actions (disturbances and contradictions) are connected to activity (new forms of activity and solutions).</td>
</tr>
</tbody>
</table>

\textsuperscript{16} System redesign takes advantage of integrating biodiversity that enhances interactions and synergisms in ecosystem functioning (Altieri and Rosset, 1996). Input substitution emphasizes alternatives to agrochemicals without challenging the monocultural structure of agricultural systems (Rosset and Altieri, 1997).
3.4 About Generalization

The notion of ‘general’ may be taken in different ways. One is to find the empirical general features of a phenomenon; for example, by surveys and statistical methods. When cases are studied, the question becomes problematic and there are several views of generalization among researchers. Robert Stake (2000; 19) argues for ‘naturalistic generalization’, claiming that case studies may be epistemologically in harmony with the reader’s experience, and thus a natural basis for generalization for that person. The findings may be facilitated to ‘transfer’ from one setting to another. In this case, generalizability is best thought of as a matter of the ‘fit’ between the situation studied and other situations (Schofield, 2000; 93). In these two, the assumption is that case studies need not make any claims about generalizability, because what is crucial is what use others make of them. (Hammersley and Gomm, 2000; 5). This study can contribute to this type of generalization by its analyses of real farming practices aiming at bringing new perspectives to the discussion about organic farming and its developmental efforts (III, page 529).

The main method in generalization of this study is the consideration of actions and practices as part of the temporal trajectory, or history, of an activity where both ‘general’ and specific on-farm farming merge. This means theoretically presuming that general macro-level phenomena are present within specific, micro-level actions and practices. This has been embedded in the study by interpreting the local and particular practices in the framework that presents the general activity. Modifications existing on a particular farm are manifestations of general aspects which can be manifested differently on other farms, while remaining modifications of the general. This goes further than Saija Katila (2000; 55) whose farmer family histories are attached to a ‘backdrop’ of the development of Finnish agriculture, or even further than Edwin Østergaard (1998; 251), whose study of the conversion of farmers focuses on the interface between individual conversion and changes in agriculture and surrounding culture.

The simultaneous merging of the particular and general activity (Figure 1 in Section 1.2) in this study is a theoretical assumption and cannot be ‘guaranteed’, as the generability of empirical phenomena are proved by quantitative data and statistical analysis. Case studies can produce general conclusions, but they are not the kind that are characteristic of survey research. In this study, the focus is not on general solutions, but on the developmental working hypotheses on organic vegetable farming that require to be solved. These developmental hypotheses are present in the concepts and tools created in the study, and their generalizability has to be tested by using and modifying them in different situations in time and space. An example is the use of this framework (Figure 3, Section 2.1) in an educational event with 14 organic vegetable farmers.

17 This type of generalization follows dialectics (see Il’enkov, 1978; Töttö, 1982).
3.5 Lessons from the Research Process

Validity and Research Quality Criteria

Alrøe and Kristensen (2002) look for quality criteria for systemic research. They find two: relevance and reflexive objectivity. The former means that the research should be relevant to people within the system studied. The latter means that researchers need to have two viewpoints on their object of study. The first is the actor’s view, which means that the researcher looks at the system being considered from inside. In practice, this means that researchers share the world-view, values and goals of the system they are researching. The second is an observer’s view in which the researchers need to step outside the system. They need to be aware and make explicit the distinction between the system and its environment. The outside position allows “the observer to learn about the independent dynamics of the system” and “for an ‘objective’ description of the specific value-laden point of departure of the research” (Alrøe and Kristensen, 2002; 74). The observations from the outside view will be used later in the further actions of the system. The authors call this a self-reflective circle of learning in research.

Similar positioning is suggested by Yrjö Engeström and Reijo Miettinen (1999; 10):

Activity system as unit of analysis calls for complementarity of the system view and the subject’s view. The analyst constructs the activity system as if looking at it from above. At the same time, the analyst must select a subject, a member (or better yet, multiple different members) of the local activity, through whose eyes and interpretations the activity is constructed. This dialectic between the systemic and the subjective-partisan views brings the researcher into a dialogical relationship with the local activity under investigation.

The subjects’ or actors’ view from inside the system was gained by the detailed ethnographic field work of this study. Quality control was built into this process by building hypotheses from the field notes or audiotapes of previous visits, and testing them during the succeeding visits. My observations were being similarly validated. Besides, other intervention methods were used (see ‘researcher’s relation with her research object’ below). The structure of the activity system (VI, page 132) and the cycle of expansive learning (II, page 89), and literature about Finnish agriculture and organic farming (Katajamäki and Kaikkonen, 1991; Sonkkila; 2002; Rajala, 1995; Kallio, 1998) were used to view the system from outside. My participation at the Center for Activity Theory and Developmental Work Research helped me see farming and agriculture from outside and to compare them to other work activities and domains. The findings were again discussed together with the farmers, as well as the framework in Figure 3 (Section 2.1).

Multiple data sources and data-gathering methods were used. In addition to qualitative data, documents and quantitative cultivation technical data, such as soil analyses, yield levels and spade diagnoses were collected. Similar data for systematic qualitative analyses
enabled comparison between the farms. The major elements of this comparison are embedded in concepts such as ‘customer-orientedness’, ‘farming across the years’, ‘input substitution’, ‘system redesign’, and so forth. Historical analyses, both local and national, the ethnographical field work, and systematic analyses of selected data enabled careful consideration of temporal, social, material and discursive contexts.

Two culturally different types of farm enterprise were selected for empirical examination, the theoretical ideas and information having guided the selection (Gomm, Hammersley and Foster, 2000; 105). Choosing two cases that are diverse according to some potentially crucial aspects created a comparative setting for the analyses.

The Researcher’s Relationship with her Research Object

In data collection, there was a dialogue between the researcher and the practitioners. I was trained as a horticulturalist and had been working with organic vegetable farming, including the Kola and the Alanen farms, for many years. This means that I was able to discuss and even give advice or ideas about technical cultivation questions with them. For the Kolas, this was an important motive for joining the study. I was respected as a resource person in certain questions concerning organic farming.18 Beside knowledge, my role included some limited authority as an expert in organic farming. ‘Limited’ means that I was not familiar with administrative regulations and could not help farmers with these. Because of my promise of anonymity, I entered into their relations as a researcher, not as a normal participant.

Being an insider in organic farming, my position may have directed the farmers to view organic more positively than had they been talking with somebody else. Even if this were so, they still expressed some criticism of organic techniques, standards or administration. I could observe their uncertainties and difficulties which they talked about openly. I consider that ethnographical field work during our long-lasting and trustful relationship increased reliability. Even though I influenced their farming, I was unable (even if I would have liked to) to shake the main dynamics of their activities that are the interest of this study.

My expertise, especially at the beginning of the study, has directed me to consider the technical questions more, while others, especially the social aspects of farming, were revealed later. Beside activity theory, my expertise in behavioral and social sciences is modest, which has obviously affected the research process and findings. However, my being an insider both in organic farming and cultivation technical questions enabled me to make friends and establish trust.

18 I was also a female, a consumer, a researcher, and a capital city dweller.
The following forms of intervention were used:

- Asking questions. This was not only for data collection, but also for the purpose of reflection by farmers (and inspectors).

- Giving advice. This consisted mainly of answering questions such as “we have planned to do like this; what do you think of it?” or “what would you suggest?” rather than instruction. Sometimes I supplied written technical cultivation material. I did not advise when my aim was to find out how they thought of solving problems or resolving situations.

- Planned interventions. Modeling the past and present activity systems, and discussing field notes, short stories or articles after they had read them. Planning the crop rotations. The activity and future of the farms were discussed with the help of the framework (Figure 3). Together with the Alanens I formed rules for hired farm workers.

- Motivation and encouragement. This was perhaps most significant during the difficult summer for the Kolas in 1998.

The purpose of these was to facilitate reflection by the farmers, to enhance interaction and to evaluate the validity of the researcher's interpretations. This enhanced the quality of the study.
4  Key Findings and Discussion

4.1  Key Findings

As is typical to qualitative studies, the development of a theoretical framework proceeds hand in hand with the research findings. In this study, this means that the theoretical framework created is simultaneously an outcome. The key findings are summarized in italics at the end of each research question.

1.  What are the relevant dimensions in object construction in organic vegetable farming?

One of the key findings is that farmers construct their farming object, although the same in general terms, in different ways. The findings show how social and societal aspects are closely related to the material in the farming activity. Although the object can be historically understood, it is not fixed (I, page 283). The findings of the articles and the trajectories of the farms presented in this thesis (Section 1.3) show that the object is in constant motion and does not develop in a linear, predetermined way.

One of the main differences in object construction found in the study was customer-orientedness, an important feature of the object of the horticultural Kola farm (I, page 286). In planning the crop rotation, the Kolas responded to expected good demand by wanting to increase their vegetable acreage (I, page 288). On the agricultural Alanen farm, the basis of the object construction was production rather than customers and their demand (I, page 286). Despite existing demand for vegetables, the Alanens turned to rye cultivation instead of increasing the vegetable acreage (I, page 290). The reactions to customers and marketing in organic vegetable farming can be the reverse.

But the findings reveal more than this. The potential for increasing vegetable acreage is limited because of the obligation to plan and implement an officially accepted crop rotation with green manures. This obligation came from newly institutionalized organic regulations, and the limitation on the quantity and quality of green manure can be brought in by advisors in planning crop rotations (I, page 289). The question of crop rotation and green manure also has another character since these are relatively new tools that fit well with and support the historically constructed object of agricultural farming that includes soil fertility. As an example, no administrative regulation immediately influenced the crop rotation planned for the Alanen farm in 1998 (II, page 93). Although farmers can oppose increasing their vegetable acreage when the demand is good, they may still respond to demand-issues in other expansive ways (I, page 290; see research question 3 below). The customer-orientedness of the object construction may differ if farmers deal directly with their customers, or if the demand is mediated by marketing cooperatives or other organizations.
Administrative rules can restrict the independence of the farming activity. Despite this, regulations may simultaneously be considered and direct the way that organic farming is introduced and learnt (II, page 94). Together with the regulations and how they were dealt with in crop rotation planning and organic inspection, the environmental protection part of the land object is likely to be important. For example, the Kolas put the winter coverage requirement into practice, which influenced the structure of their farming activity (II, page 95). Although it is possible in the short run for farmers to ignore administrative regulations (II, page 93), the findings suggest that sooner or later administrative subsidies and rules are woven into the object construction (IV; Section 1.3), which is societal integration. Administration is interwoven into object formation in different ways.

Farmer cooperation and advisory services are potential relations which in the long term offer help in technical cultivation problems such as the Kola’s couch grass (Sections 1.3 and 2.3). What is necessary in both of these relations is that they support the use and understanding of organic farming techniques in a broad sense. Problems with cultivation techniques and field management show the importance of ‘organic relations’ in the object construction. These relations can also be built between farmers and administrative officials, such as inspectors (V).

The relevant dimensions in object construction in organic vegetable are 1. use of natural resources, and 2. societal integration and social relations (Figure 3).

The use of natural resources, mainly land, can reasonably be categorized into two layers that shape the object of farming: 1. soil fertility, or maintenance of the resource base and 2. environmental protection.

Three relevant the categories of the societal integration of the object construction emerge: 1. market relations, 2. administrative relations and 3. organic relations. These categories often overlap.

2. What are the developmental contradictions and learning challenges in organic vegetable farming?

The main finding of this study is the contradictions in and between the dimensions in the object construction of organic vegetable farming (VI, Figures 2 and 3, page 137), which are also seen in other elements of this activity. One central contradiction within the object was short-term, intensive use of resources as against their ecological and sustained use. This contradiction was obvious in the activity of the horticultural Kola farm (I and VI). It was observed in the portion of the vegetable acreage of the farm and in the choice of green manuring practices (I, pages 288 and 289). Couch grass as disturbance can be seen as a result of lack of anticipation, which in turn stems from this developmental contradiction (VI, page 134). These observations would not have been possible without considering the historical development of organic farming (I, page 284; II).

Another central contradiction of the object was independence and self-sufficiency as against societal integration, present on the agricultural Alanen farm. It was observed in the
ways farmers both oriented themselves to and rejected demand when planning their production (I, page 290) and in the disturbances and actions with hired workers (VI, pages 134 and 141).

Figure 3 represents the contradictions as dimensions in a field which implies that they are interwoven. In effect, the use of natural resources has a societal aspect. The examples above show how land use, environmental questions and so on go hand in hand with the relations of the on-farm activities with the outside world. Societal integration also has a material aspect, but it is not always immediately or directly related to the use of natural resources, which is the case, for example, in actions concerned with the use of hired labor (VI, pages 140-141). Contradictions as sources of expansive practices of the Kola and the Alanen farms are presented in the following research problem and in Table 2.

Contradictions in the local activity generate learning challenges that are the basis of significant learning. Because of differential developmental contradictions, and because the same contradictions can be manifested in many ways, farmers with different histories have qualitatively somewhat different learning challenges in organic vegetable farming (I, page 291).

The analysis in article II abstracts learning challenges in societal integration from their material context. They are actualized in the farming practices (II, Tables 2 and 3, pages 92 and 94). The study suggests that the learning challenges of organic vegetable farming in societal integration are partly shared (such as subsidies, other farmers, and links with extension, education and research), and partly different for farms coming to organic vegetable farming from different histories. The specific learning challenges of the Alanen agricultural farm in societal integration were demand and marketing organizations and, for the Kola horticultural farm, public administration (II, page 99). The use of the concept of customer by farmers implies that the link between them already exists, which shows that the initial problem of lack of customer-orientedness has already been overcome. After re-examining and re-interpreting these categories in this thesis, it seems that, from the point of view of learning challenges, the three categories of societal integration listed above are the most relevant in organic vegetable farming.

In the use of natural resources, planning, managing and implementing crop rotations present learning challenges (VI), as does system redesign (V). Yield levels are also an example of learning challenges in natural resource use (VI, page 140). The learning challenges in the time dimension of the object implies not only the longer time perspective but also short-term quick actions when needed (IV). In practice the temporal expansion of the object means facing other learning challenges, such as how to see the fields, the linkage between different representations of the crop sequence, and overcoming the nutrient paradigm (III). Because crop rotations have a central and systemic character in the organization of organic farming, many of the contradictions and learning challenges are somehow reflected in their planning and/or implementation.
The central contradictions in organic vegetable farming are short-term and intensive use of resources as against ecological, sustained use of resources, and independence and self-sufficiency as against societal integration. In local activities, they generate learning challenges that form the basis of significant learning. System redesign and a long-term perspective, including planning, managing and implementing crop rotations, are learning challenges. The findings suggest that subsidies, other farmers, and extension, education and research are common learning challenges in societal integration.

3. What do the contradictions and learning challenges suggest about the zone of proximal development in organic vegetable farming?

The object of organic vegetable farming is so heterogeneous that it keeps many alternative directions for future action and development for the individual farm open. Figure 3 is a framework which shows the main alternatives at farm level. The ‘integrated’ object, the upper right-hand field, is the zone where potentially expansive solutions in the dimensions of the use of natural resources and social relations are found.

Expansive learning in this study means actions that can be interpreted in a certain local farming activity in time and space as moving towards the integrated object. The movement along these dimensions is often uncertain, complex and risky. The change is not linear, since the findings show examples of movements in all directions. The exact content of the dimensions and the interpretation of where various practices and actions are moving need to be judged locally. Despite this need for local definition (see VI, pages 133, 142), the findings of this study suggest some commonalities or potential general outlines of the practices that move the farming activity towards the integrated object.

Before going into these practices, it is necessary to remember that the dimensions in the framework (Figure 3) are about object construction in organic vegetable farming. The very concept of an object implies that a preferred type of object cannot be determined exactly, because of the multiple layers of the dimensions which shape its meanings (see Sections 2.2-2.4, and research problem 1 above). The object is thus never completely achievable. If the contradictions of the dimensions are resolved, a new object emerges that brings new contradictions with it. The types of contradiction in the dimensions and between the dimensions (Figure 3) are so fundamental, however, that they still remain, although they need to be continuously resolved. This study emphasizes the persistent character of such contradictions in organic farming activity. It is unlikely that new techniques or technological innovations would completely undo the central contradiction in the use of natural resources, or new cooperative practices and organizational forms would eliminate the contradiction between independence and societal integration. But much movement, or ‘room for manoeuvre’, is possible within and between the dimensions.

Table 2 shows the expansive practices that have been found in the six dissertation articles. Since they are seen as expansive in the local and historical contexts of the Alanen and the
Kola farms, they cannot be claimed to be expansive everywhere: rather, they have the potential to be expansive. An expansive action or practice is not merely a learning challenge, since something has already been done in an expansive way to the challenging issue. As to generalization, more important than the issue as such is why it is expansive. Expansions cannot be understood without considering the historical contexts and contradictions of the activities.

**Table 2. Expansive practices found in the articles.**

<table>
<thead>
<tr>
<th>Name of the practice</th>
<th>Farm</th>
<th>The contradiction of the farm that the practice can potentially solve</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rye as a catch crop</td>
<td>Kola</td>
<td>Enhances nutrient recycling in the field without diminishing the acreage of vegetables sold to customers (I, Figure 2, arrow 4)</td>
</tr>
<tr>
<td>Rye as an alternative crop</td>
<td>Alanen</td>
<td>Saves work load and soil fertility (compared to vegetables) and still produces goods for sale (compared to green manure) (I, Figure 3, arrow 4)</td>
</tr>
<tr>
<td>Buying potato from another region for local demand</td>
<td>Alanen</td>
<td>Possibility to satisfy the customer needs without intensifying the farm production (I, Figure 3, arrow 8)</td>
</tr>
<tr>
<td>Farmer cooperation</td>
<td>Kola</td>
<td>Opportunity to satisfy the demand that exceeds the farm production; overcoming the horticulture-agriculture boundary (I, Figure 2 arrow 3; II, page 95)</td>
</tr>
<tr>
<td>New crop rotation plan + implementation</td>
<td>Kola</td>
<td>Maintaining soil fertility while producing enough vegetables (VI, Figure 7, page 142)</td>
</tr>
<tr>
<td>Rules for hired workers</td>
<td>Alanen</td>
<td>Moving from community-based work of the farmer family towards organized work with hired labor from outside (VI, Figure 7, page 142)</td>
</tr>
<tr>
<td>Speech across the years</td>
<td>Kola</td>
<td>Short-term production vs. long-term field management (III, page 531; IV, page 182)</td>
</tr>
<tr>
<td>Creating social relations with administration</td>
<td>Kola</td>
<td>Regulations as restricting the production vs. regulations as means of managing production (IV, page 172)</td>
</tr>
</tbody>
</table>

On the Kola enterprise farm, the idea was to sow rye as a catch crop (Table 2) in the fall in order to meet the winter coverage requirement of reducing the nutrient load into water-courses. This was innovative because it did not reduce the acreage as production potential in order to satisfy demand, but still took into consideration the sustainability of resource use in enhancing the nutrient recycling in the field. This helps to some extent in solving the contradiction between market-dependent income-earning production and the reproduction of the fertile field conditions (Seppänen, 1999a). Catch crops were not a standard practice at that time on organic vegetable farms. The catch crop example shows the type of innovation which could develop organic vegetable farming further.

The cultivation of rye on the Alanen farm had other significance. Compared to vegetable production, rye saves work and maintains soil fertility. Rye seemed to be an intermediate alternative between profitable, soil- and work-consuming vegetables, and non-profitable, soil-improving green manures. Rye can be marketed, which is often not the case with green manures.

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19 Contradictions are expressed as near to the local practical farming and I do not distinguish between different types of contradictions here.
The following two expansive practices deal with farmer cooperation. The idea of occasionally buying potatoes from another region for the local customers (Table 2) was expansive because Alanen farm customers became so important that it exceeded the farm production. It also crossed a regional boundary. The Kolas planned to cooperate with another farmer family both in marketing and in production. This was expansive because it helped the Kola farmers better satisfy the expected demand that exceeded their production capacity, and because it crossed the cultural boundary of independent horticultural entrepreneurship towards agricultural farmer collaboration (Table 2). It was also a new organic relation that supported their organic way of farming. (This expansion is seen in article I, Figure 2 on page 288, arrow 3, but is not explained in the text).

Crop rotations (Table 2) are often planned on organic vegetable farms and cannot be considered expansive as such. But crop rotation planning may be expansive, as was the case on the Kola farm, because the new crop rotation with its perennial green manures and vegetable growing on rented fields aimed at maintaining or improving soil fertility and still having a satisfactory acreage for vegetables (III, IV, VI). Rules for hired workers were intended to create a new work organization and division of labor on the Alanen farm (Table 2). The hired workers from outside the farm, village community and even outside agriculture required that the farming activity move towards a new type of entrepreneurial societal integration. Speech across the years (Table 2) expanded the temporal dimension of the object by making and strengthening the link between actions of ongoing growing season and the long-term field management.

Creating social relations with administration (Table 2) is related to organic regulation and crop rotation plan as a part of it. The implementation of regulations and standards as such does not imply expansion, but, when actualized in local conditions, this implementation may include potential for expansion (Haavisto, 2002; 303). Uncertainty about the restrictive regulations forced the Kola farmers to make contacts with administrative agencies. This is social expansion. As a result of this expansion, the farmers came to see the bureaucratic permissions not only as restrictions but as a means of mastering their own crop rotation and land use (IV, page 172).

Comparing the contradictions and expansive practices in Table 2 with the dimensions in Figure 3, we can see that the contradiction within the dimension of the use of natural resources (intensive, short-term vegetable production vs. managing long-term soil fertility, Figure 3) is manifested on both farms, although in different ways. The dimension of the use of natural resources is closely connected to the dimension of societal integration, especially to customers and marketing.

These expansive practices in the contexts of the Kola and the Alanen farms show that movement in terms of both societal and entrepreneurial integration and ecological resource use is indeed possible, but in terms of the whole activity system it is difficult. They also show that the same actions or practices have different meanings in different local activities.
and points in time. In the framework (Figure 3), the expansive practices are moves upwards, to the right, or both.\textsuperscript{20}

*The movements in the zone of proximal development are often uncertain, complex and risky, and change is neither linear and nor predetermined. Learning in this study consists of expansive actions or practices that can be interpreted as moving towards the integrated object in a particular local farming activity in time and space. The expansive practices of the Kola and the Alanen farms are listed in Table 2.*

4. **What reflective tools may be used to deal with the developmental contradictions and learning challenges?**

There is no activity without tools (Section 1.2). This study identifies some of the tools already available to the practitioners. The template for planning the crop rotation, and the field map of the farm were such tools (IV, Figure 7.5 and Table 7.3, pages 168 and 169). The concept and practice of crop rotation is already an established tool, or more precisely, an instrumentality that promotes learning organic farming (III and IV). Crop rotation plans evolve as co-configurative devices, or boundary objects (Star, 1989) between administration, advisory agencies and farms (IV). A crop rotation plan is not enough, however. New tasks and instruments need to be developed for its implementation.

On the other hand, new tools were created and used in the study. Visual learning diagrams such as ‘strategies for increasing product volume’ and ‘three orientations towards farm workers’, and the model of the zone of proximal development were such tools (VI, Figures 4, 5 and 6). This study emphasizes the need to build the tools on local learning challenges, given that local analyses of contradictions and learning challenges are important for the creation of efficient learning tools (VI). Methods for analyzing learning challenges (Section 3.3) are also findings of the present work.

The framework (Figure 3) has many functions, being both a framework of analysis and an outcome of the study, showing roughly the zone of proximal development and the directions in which organic vegetable farming could be moving. Because of these functions, it can be used as a learning tool, but not alone. Its efficiency is based on the possibility of reflecting actions and practices of individual farms at the general level of organic vegetable farming activity. Its uses will be further elaborated in the discussion (Section 4.2).

The study reveals the potential of tools of talk or ways of communication understood as learning tools. In contacts with customers, communicating as directly as possible helps farmers learn market relations (II, page 96). ‘Speech across the years’ (III, IV), meaning that annual boundaries are crossed by talk, as well as an expansive practice, is a tool for temporal expansion. In organic inspections, a joint negotiation between the farmer and the

\textsuperscript{20}The topic of work load (see the rye crop alternative of the Alanen farm, Table 2) would be of interest for further theorizing at the zone of proximal development of organic vegetable farming.
inspector, inspired especially by shared observation of the fields, could potentially be developed into a co-configurative instrument to promote system redesign and anticipatory and developmental functions in organic inspections (V).

Crop rotation plans are both learning tools and devices evolving in cooperation between farmers, advisors and administrative agencies. The deliberate creation of new learning tools in this study is based on analyses of contradictions and learning challenges. The model (Figure 3) provides a rough image of the zone of proximal development in organic vegetable farming which can be used as a learning tool for reflection. Methods for analyzing learning challenges are results of this study. The visual learning diagrams, ‘strategies for increasing product volume’ and ‘three orientations towards farm workers’, were created and used in the study. Ways of communication such as ‘speech across the years’ and joint negotiation between the farmer and the inspector reveal the potential of talk-based learning tools.

4.2 Discussion

Learning and the Conversion Period

The notion of ‘conversion’, which implicitly assumes that there is a standard organic pattern that needs to be learnt, means transforming the production from conventional to organic farming. This study identifies already converted organic vegetable farming practices and shows that this is not the case. Organic farming itself is undergoing many changes, and the organic way of farming is reconsidered and sometimes reshaped in the farming process, a process which goes on after the conversion period as well.

Use of the Framework as a Learning Tool

The reflection of local actions and practices within the framework (Figure 3) may reveal to practitioners that what they do on their farms or in advising and inspecting is not isolated from how organic farming in general develops. The approach of instrument-mediated activity (Béguin and Rabardel, 2000) suggests that an artefact turns into an instrument only in and through its use by the users. Because the framework is an abstraction, facilitators need to give examples of its utilization when introducing it. The framework may turn into an instrument when farmers or other practitioners re-invest it with their own actions and practices.

Because of the complex nature of the concept of the object, the placement of practices or of entire farms in the model is a theoretically demanding task. In article I, the Kola farm was initially placed on the left side of the Figure, while the Alanen farm was on the right. The placement of farms on this dimension is a combination of intensity of land use, and natural resources being either a tool or an object in the local farming activity. The
interpretation of the latter is based mainly on the ethnographic part of the study. The land use was intensive on the Kola farm (I, Table 1, page 286), and more extensive on the Alanens. This is to be understood as instances in a dynamic activity where moving in other directions is possible. In fact, Antti Alanen’s plan in summer 1997 about starting an intensive rotation with vetch (I, page 287) was a move to the left. For the Kolas, natural resources means of carrying out their market-driven farming activity. At the Alanen farm, natural resources, especially field land, was an object and purpose of farming. The main feature placing the Kolas up and the Alanens down was a question of markets in their object construction. Marketing relations were in the object of the Kola farmers.

The framework (Figure 3) was discussed together with the Alanen and the Kola farmers. The Alanens considered Chinese cabbage to be up on the right, and potato for local consumption lower right in the framework. Beside the Kola and Alanen farms, the framework has been used as a learning tool in an educational event for organic vegetable farmers. It may help increase the awareness and reflection of practitioners, as was proposed by Ison et al. (2000).

In Finland, there is actually a need for value discussion of definitions of organic (Rantanen, 2003). More importantly than providing ‘correct answer’, this study may contribute to this discussion by offering grounded tools for reflection, such as concepts or models.

The intensive and short-term as against ecological and sustained resource use -dimension is based, firstly, on the differences in the Alanen and Kola farming activities and their object construction; secondly, on certain explicit organic conceptions of the use of natural resources; and thirdly, on the agroecological work of Miguel Altieri and Peter Rosset (1996; Rosset and Altieri, 1997). This dimension starts from the alternatives that organic farmers face in their activities. The argument that intensive farming is not ecological and sustainable can be criticized and would be a topic for research in agroecology. Environmental friendliness has helped organic farming to gain its popularity. But the ecological tendencies in all agriculture and society may to some extent blur the essence of being organic (Østergaard, 1998; 57-58).

Learning Challenges and the Zone of Proximal Development

In terms of the general activity of organic vegetable farming, moving upwards to the left in the framework (Figure 3) corresponds to the conventionalization argument discussed in the literature of rural sociology (Section 1.1). Moving downwards to the right would mean cutting off from societal relations, and perhaps becoming marginalized. Moving upwards to the right would mean both creating social and societal relations that support ecological

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21 It would be interesting to research the use of the framework.

22 The aims of organic agriculture in Finland include enhancing the biological functions of agriculture, principally using renewed and local natural resources, maintaining biodiversity, and improving soil fertility (Rajala, 1995; 27).
and sustained use of resources and establishing markets for organic vegetable products. Expansion would imply integration between ecology and marketing.

Expansion means not only learning within actions or practices such as those described in Section 4.1, research problem 3, but also transformation of the whole activity system (farm) towards the upper right quarter of Figure 3. The trajectories of the farms (Section 1.3) showed that the Alanen farming activity did not expand, because, rather than continuing vegetable production other than their traditional potato production for local customers, they expanded in acreage and strengthened other activities (cereal production, forestry and wood-processing). This shows the insecurity of vegetable growing on farms. If heavy investments or long-term contracts for vegetable production have not been made, the situation is reconsidered each year, and vegetable farming can be reduced, increased or even stopped. This also means that vegetable farming may be restarted again. Perhaps it would be helpful to construct the zone of proximal development of the Alanen farm by means of the care-taking dimension and biodynamic ideas of organic farming. At the general level, this would imply emphasizing the ethics of production and the particular society-nature relations of organic farming.

The development of the Kola farming activity in 1998 may be interpreted in two ways in terms of expansion. The first is that their activity did not expand because the planned new pattern had not as yet succeeded. Crop rotation may be seen as an intermediate, secondary tool between more explanatory tertiary artefacts, and more practical primary artefacts (Engeström, 1990; 188; Wartofsky, 1979). The latter are tools in farming actions and practices, techniques for field management, and implementation of crop rotations. Successful expansion in the integrated object requires that all these three levels be enhanced in balance, and this did not happen in the Kola activity. The second interpretation is that the vegetable farming activity of the Kolas in 1998 expanded into the integrated object, and that the worsened couch grass situation (see the narrative in Section 1.3) was a problematic outcome of the succeeding cycle. In this case, the zones of proximal development need to be reconfigured in terms of relatively rapid successive cycles of development.

Marketing cooperation among farmers may also create a new activity system as was the case with the Alanens in 1995 when organic vegetable farmers in the region jointly founded a marketing company (Section 1.3). This was an expansion that created a new marketing activity. Its members had a double object: the farm, and the marketing company. In the framework (Figure 3), marketing cooperation is a move upwards towards societal integration.
The Question of the Endogenous and Exogenous Nature of Development

The dynamic and heterogeneous nature of the local construction of the object of organic vegetable farming and on-farm inspection practices (research problem 1), the contradictions and their manifestations in farming actions as learning challenges (research problem 2) and the expansive movements in the zone of proximal development (research problem 3) are examples in which practices cannot easily be grouped either as endogenous or exogenous. External changes occurring beyond the farm often prompt a question that needs to be dealt with in the farming activity, but the findings of this study show that the way they are dealt with and interpreted is not externally predetermined. The boundary between the external and the internal becomes blurred. “The issue is more a question of definition (and redefinition), the negotiation (and renegotiation) as well as practical elaboration of the required balance and mutual interaction of both internal and external elements” (Cristóvão et al., 1994). As the expansive practices listed above show, situationally created practices may generate something that can be considered qualitatively new in the context of the local farming activity. These expansive actions can extend and form new structures and activities, as was the case of the marketing company, and as was probably the case in the emergence of collective milking houses in Portuguese villages (Cristóvão et al., 1994). Such practices make clear that there is, beside an endogenous one, an exogenous element involved in expansive learning (see Saari, 2003; 221-223). The dimensions of the framework (Figure 3) can be understood as actual aims of Finnish agricultural policy – becoming both more entrepreneurial and more ecological - which makes it difficult to draw a clear distinction between the endogenous and the exogenous.

Development and Modernity

In rural sociology, there are authors who take modernization for granted (Bohler and Hildenbrandt, 1990). Others seem to oppose it (Kumpulainen, 1999; van der Ploeg, 1994; Silvasti, 2001). In both cases, modernization is a yardstick that implicitly or explicitly ‘measures’ development. By contrast, the present model (Figure 3) does not take a stand on modernization, suggesting that it is neither preferable nor avoidable. This is not to claim that this question, which manifests itself as pressure for specialization, mechanization and increase in scale, is not faced by organic vegetable farmers. Rather it is a question that needs to be experimented with and solved locally. The framework (Figure 3) represents the ‘general object’ (IV, page 181) that offers means to reflect on how local particular actions relate to it. According to Pekka Jokinen (1995; 141) the environmental services of agriculture can be viewed in the context of post-industrial production structure. This means that some agricultural activities convert directly into the service sector, and post industrialization takes place as simultaneous changes within agriculture. This may partly explain the difficult complexity characterizing object construction by farmers.
4.3 Future Research Challenges

Exploratory study applying activity theory in a new field of organic agriculture opens up issues for further research. The learning of farmers in technical cultivation questions is potentially facilitated by ‘organic relations’, consisting mainly of other farmers and advisors, but also of administrative officials such as inspectors. Do ‘organic relations’ center purely on technical cultivation issues and field management? Does communication by farmers in marketing relations have something to do with organic relations? This is to ask whether the definition of ‘organic’ is confined to primary production and use of natural resources in farming and, if not, what is it? And what do organic relations mean in terms of crossing cultural boundaries? These questions are left for future research.

My empirical data was collected mainly during 1997-98. Collection and analysis of more recent similar data (organic inspections and crop rotation planning sessions) and comparing them to the findings presented in this study would reveal long-term trajectories of change in organic vegetable farming (see Haavisto, 2002, for an analysis of long-term change).

The activity theoretical concept of the object has helped to clarify the relationship between the material (use of natural resources) and social aspects in the formation of organic vegetable farming activity, which was a special interest in this thesis. Actor-network theory (Latour, 1996), especially its applications in agro-food studies and natural resource management (Goodman, 1999; Junitti, 2002; Kaltoft, 2001; Steins, 1999) share the same concern. Miettinen (1999), in the field of technical innovation studies, offers a soundly-based comparison between activity theory and actor-network theory. How might these two approaches together contribute to the inclusion and understanding of natural resource use in agro-food studies?

In rural research, there is a quest for multidisciplinary research into the question of sustainability in agro-food systems (Yli-Viikari, 1999), to which this study may contribute in at least three ways. First, the understanding gained about the links of the use of natural resources and various forms of societal integration could be interpreted in terms of sustainable development. Second, it would be of interest to see what it is that is sustained in the processes of change and learning. Third, the methodology and methods applied and developed here could be used elsewhere for the interdisciplinary study of sustainability questions (see Seppänen, 2000).

Although relations between farms and other activity systems have been considered in this study, the main focus has still been on-farm practices and the farming activity. In the future, there will be need to study dynamics of change in farming as part of agro-food networks consisting of multiple activity systems. This corresponds to the third generation of activity theory (Engeström and Miettinen, 1999; Hill and Botha, 2002). This will be a major concern for future research (Seppänen, 2002).
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Maunula, January 4, 2004    Laura Seppänen
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Activity Theoretical View on Crop Rotation Planning in Organic Vegetable Farming
Activity Theoretical View on Crop Rotation Planning in Organic Vegetable Farming

Laura Seppänen

Abstract

Crop rotation is an essential basis of an organic farming system. An activity theoretical concept of object shall be used in examining planning processes of crop rotations. Farmers' object construction means their creating and maintaining the social meaning and purpose of the material farming activity. I shall assume the farmers' object construction in planning crop rotations to reflect their overall object in organic vegetable farming. First, this paper examines theoretically the object in organic vegetable farming by devising a framework of different types of object constructions. Second, two farms with organic vegetable production will be described, and the farmers' objects will be shown in the light of the histories of the farms. This will show that the different types of objects have not evolved at random. Third, the dynamic movement of the object construction in the crop rotation planning processes is explored. The results will show that the farmers' object, although historically understood, is not fixed. On the contrary, the object is in a constant move and even contradictory.

1. Introduction

With the integration to the European Union, Finnish agriculture is going through an intense change. In a short period of time, organic agriculture in Finland has transformed from a farmers' movement to an institutionalized part of agricultural policy. In 1998, nearly 6 % of the Finnish farms were converted to organic production (Sirén 1999). This paper deals with organic vegetable farming. It is still undeveloped in Finland, owing to the fact that the actual cultivation techniques require a lot of manual work, and, partly, because the subsidy policy does not encourage organic vegetable farming (Koikkalainen 1999, p.73). But organic vegetable farming is on its way to a more specialized, mechanized production.

Röling and van de Fliert (1994, 96) suggest that "Sustainable agriculture is not an 'innovation' that farmers 'adopt'. Changing to more sustainable practices is more like a paradigm shift, involving a learning path leading to new perspectives on risk avoidance, new professionalism, a greater reliance on one’s own expertise and observation...". By analyzing crop rotation planning, this paper examines this learning path of the farmers. Rather than starting from predetermined goals to learn, the farmers' learning is looked at within their object construction in planning crop rotations. This paper assumes organic farming to be an attempt towards sustainable agriculture.

2. Object in planning a crop rotation

What is an object? According to Webster’s dictionary (1987, 257), an object is both "anything presented to mind or senses" and "an end or aim". It is an important concept in activity theory (Vygotsky 1978, Leont'ev 1978, Engeström 1987).

"So the object is both something given and something projected or anticipated. This very duality of the meaning of the term indicates that the concept of object carries in it the processual, temporal, historical nature of all objects. Objects are objects by virtue of being constructed in time by human subjects. This in no way diminishes their reality and materiality. But despite its materiality, an unknown particle or a mineral in the rock is not object for us before we somehow make it our object - by imagining, by hypothesizing, by perceiving and by acting on it." (Engeström 1990, 107)

The object is always part of a collective human activity, and part of the material world as well. The object of organic farmers consists of what they are working on, like soil and plants, vegetables and
customers. The object is heterogeneous and farmers construct it in different ways. The societal motive, why vegetables are cultivated in organic way, is embedded in the object. In object construction, the farmers constantly reproduce, or change, the farming activity.

Learning may occur at several levels. Everyday problem solving means learning on the level of actions, such as buying a fax machine to facilitate communication with customers. But sometimes it is not enough to solve everyday problems only: the whole farming activity has to be perceived differently than before. In other words, the object of farming has to be constructed and understood in a new way.

The role of crop rotation is crucial in organic farming (Council regulation (EEC), 1991). In planning the crop rotation, a sequence of crops is formed that would benefit the yields and sustain the farming system. Especially important is the use of green manures with nitrogen-fixing legumes, such as clover or vetch, in order to produce locally this important nutrient for plant growth. Besides nitrogen production, green manures have many other beneficial effects in the farming system, like maintaining the soil structure. Crop rotation is often represented as a table for several years (see table 3). A successful crop rotation plan makes all the elements of the farming activity fit together.

The way different elements are taken into consideration depends on farmers’ construction of the object: To what extent are the customers part of the object? Is the environment, such as the water courses outside the farm, considered? Because the crop rotation has a crucial role in organic farming, I shall assume that the way the farmer constructs and plans crop rotation, reflects his or her way of constructing the overall object in organic vegetable farming.

Crop rotation requires a longer time perspective than one productional year. "An organic farmer must always look ahead over at least one year, when choosing, for instance, crops for the next growing season, while in the conventional production, solutions can be made for one growing season only" (Partanen 1999). The paradigm change from conventional to organic being a vast one, learning and managing crop rotations is not always easy for the farmers. Crop rotation plans have an institutional role as well: A crop rotation plan for at least five years is required for the status of an organic producer, and the changes in crop rotation plans must be confirmed by the authorities.

For finding out different types of objects within organic farming, I have outlined two dimensions of the object. The first one, drawn from the history of sustainable and organic farming, I shall call **sustainability in resource use** (fig.1). An ecological and sustained use of soil, energy and other natural resources is crucial in sustainable agriculture and organic farming (Helenius 1998, Granstedt 1999). In sustainability, the use of local resources and natural processes is preferred to external inputs (Altieri and Rosset 1995, Pretty 1998, 26).

The other dimension, which is drawn from the history of Finnish agriculture, I shall call **entrepreneurship and customer-orientedness**. Agriculture has been a protected sector in Finland for a long time, and therefore, entrepreneurship and customer orientedness are relatively new learning challenges for farmers. (Katajamäki & Kaikkonen 1992, Routamaa & Vesalainen 1992). Entrepreneurship has been studied in many ways (e.g., Sireni 1996, Levander 1998, Turkki 1998). Here, I shall concentrate in the customer orientedness, because farming is economically dependent on demand, and taking into consideration the customers’ needs is essential in entrepreneurship. Marketing is especially important in horticulture and vegetable production. In the latter, subsidies play a role in the economy, but they are not pivotal.
Theoretically, four different types of objects of organic vegetable farming can be found within the matrix formed by the dimensions "entrepreneurship and customer-orientedness", and "sustainability in resource use":

1. **Ambiguous object.** Farming is oriented neither towards sustainable use of resources nor towards customers. The so-called "quasi farmers" (Peltola 1999), converted to organic farming in order to maximize the subsidies, can be grouped here, as well as traditional farmers interested mainly in maintaining the old rural lifestyle. The time-dimension in the planning is short, consisting mainly of one-year productional cycle.

2. **Resource object.** In this type, farmers are mainly concerned about the maintenance and improvement of natural resources, like soil fertility. Crop rotations are considered as an essential tool in this. A prolonged time perspective, important in planning and implementing crop rotations, corresponds to the old peasant time conception over generations (Kuisma 1992, 10). The linkage of the production to the markets is not playing an important role.

3. **Market object.** In this type, economics and entrepreneurship are emphasized. The customers and the products with organic label are of importance to the farmers. The time perspective is short. The ecological ways of resource use, such as crop rotations, are considered as a rule limiting the marketing possibilities.

4. **Integrated object.** The sustainability of resource use is not opposite, but an integral part of marketing the products. Crop rotation brings continuity to production and quality to the products. The time perspective is long and exceeds the short term marketing possibilities. Here, integrated means that there is a fruitful integration of organic ideology and sound microeconomics (see also Kallio 1998, 112-113).
4. Research sites

The empirical data in this study come from two farms producing organic vegetables. They both converted to organic farming in 1991 and started with field vegetable production some years later.

The Kola farm with nine hectares of fields, used to produce flower bedding plants in greenhouses. The growers, Maria (49) and Kai (60), have been running a horticultural enterprise rather than a farm. Entrepreneurship is important in the object of the farming activity of the Kolas.

**LS:** What is best, in your mind [in being a farmer, LS]?

**Maria:** What would be the best? Surely, it must be the same as in entrepreneurship in general, that you can be your own master.

(Maria Kola 14.4.1997)

The crop rotation carried out on the Kola farm, after the clover ley during the conversion period, has been quite intensive (table 1). The farmers themselves sell the vegetables to retail markets. Based on the crop rotations and on the conceptions about entrepreneurship, the Kolas can be grouped into the “Market object” type in figure 1.

<table>
<thead>
<tr>
<th>Year</th>
<th>Field plot 1</th>
<th>Field plot 2</th>
<th>Field plot 3</th>
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<tr>
<td>1994</td>
<td>Clover ley</td>
<td>Clover ley</td>
<td>Clover ley</td>
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<tr>
<td>1995</td>
<td>Potato</td>
<td>Potato</td>
<td>Clover ley</td>
</tr>
<tr>
<td>1996</td>
<td>Potato</td>
<td>Various vegetables</td>
<td>Onion</td>
</tr>
<tr>
<td>1997</td>
<td>Onion</td>
<td>Onion, leek</td>
<td>Carrot</td>
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</table>

The Alanen farm, with 22 hectares of fields, has its history in conventional milk production. The farmers, Antti and Eeva, are around 40 years old. Eeva works outside the farm. The continuity of the farm over generations is important to Antti, which is reflected in his ideas of maintaining and improving the soils.

**LS:** What is best in being a farmer?

**A:** Surely it is that you have such a living element, like soil. It is totally different than to cut iron or the like (...) and it is continuous, like the leaven of bread, which is tens and tens of years old, maybe not even from this century (...)

(Antti Alanen 11.4.1997)

The crop rotation carried out on the Alanen farm is based on perennial green manures (table 2). They belong to a marketing company which is owned by farmers and sells vegetables to wholesale markets. In addition, potato is sold to local customers of the municipality. Because the soil fertility is of such importance to Antti Alanen, and because of the extensive crop rotation (table 2) of the farm, I consider the Alanens to represent the resource-type of the object (figure 1).

<table>
<thead>
<tr>
<th>Year</th>
<th>Field plot 1</th>
<th>Field plot 2</th>
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<tbody>
<tr>
<td>1994</td>
<td>Potato</td>
<td>Barley with undersown</td>
<td>Clover ley</td>
</tr>
<tr>
<td>1995</td>
<td>Barley with undersown</td>
<td>Clover ley</td>
<td>Vegetables and potato</td>
</tr>
<tr>
<td>1996</td>
<td>Clover ley</td>
<td>Clover ley with chinese cabbage</td>
<td>Barley and undersown</td>
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<tr>
<td>1997</td>
<td>Clover ley and chinese cabbage</td>
<td>Potato</td>
<td>Clover ley</td>
</tr>
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</table>

5. Data and methods

The data of this article consist of audiotaped crop rotation planning discussions and documents. On the Kola farm, the data consist of three hours of discussion audiotaped at the planning meeting on March 27, 1998. On the Alanen farm, the data were gathered from six planning discussions about crop rotation, during a period of nine months (from July 1998 to May 1998). The audiotapes were

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2 The names are fictional.
3 In 1997, the average field acreage on Finnish farms was 24 hectares (Sirén 1999).
transcribed. First, the planning processes were analyzed by finding the grounds for different proposed crop rotation plans. The rough outlines of the planning processes and outcomes are presented in chapter 6. Later, some data were analyzed paying special attention in the discussions to ideas in resource use and customer-orientedness. On the Kola farm, this was done starting from the first part of the planning meeting all the way through until the final crop rotation model was ready. On the Alanen farm, this was done of a one hour and 40 min long telephone discussion between myself and Antti, on January 28, 1998. The farmers’ ideas brought up in the conversations showing customer-orientedness or resource use are represented as arrows in figures 2 and 3.

6. Planning processes

Until the end of 1997, greenhouse production was the main income of the Kola farmers. In 1996, they had rented 5.5 hectares more of fields. In autumn 1997, the greenhouses were taken down - the Kolas had to rely economically on organic vegetable production. They were pursuing larger and mechanized vegetable production. According to their old plan made by an advisor, their own fields were going to be covered, to a large extent, by green manures. Maria and Kai were worried about the next summer 1998, how the new unknown rented fields would produce in a situation of increasing demand of their products. Therefore, they wanted to devise a new crop rotation plan. The new crop rotation was planned on March 27th, 1998. Besides Maria and Kai, a relatively new advisor from the rural advisory center and myself were attending the meeting. After the crop rotation model, or sequence, was ready, the fields of the farm were divided into six groups, in order to correspond to the six-year rotation scheme. Finally, the crop rotation was placed, rather mechanically, to the fields for the next five years (table 3). The planning process has been reported elsewhere (Seppänen 1999).

Table 3. The outcome of the planning in a simplified form: the crop rotation scheme for the next five years for the Kola farm. The rented fields are shown in white and the farm's original fields in shaded rectangles. (The column 1997 shows the preceding crops).

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<tbody>
<tr>
<td>1.</td>
<td>perennial green manure</td>
<td>vegetables</td>
<td>vegetables</td>
<td>annual green manure</td>
<td>vegetables</td>
<td>perennial green manure</td>
</tr>
<tr>
<td>2.</td>
<td>vegetables</td>
<td>annual green manure</td>
<td>vegetables</td>
<td>perennial green manure</td>
<td>perennial green manure</td>
<td>vegetables</td>
</tr>
<tr>
<td>3.</td>
<td>perennial green manure</td>
<td>perennial green manure</td>
<td>vegetables</td>
<td>vegetables</td>
<td>annual green manure</td>
<td>vegetables</td>
</tr>
<tr>
<td>4.</td>
<td>vegetables/ green manure</td>
<td>vegetables</td>
<td>perennial green manure</td>
<td>perennial green manure</td>
<td>vegetables</td>
<td>vegetables</td>
</tr>
<tr>
<td>5.</td>
<td>vegetables/ green manure</td>
<td>vegetables</td>
<td>annual green manure</td>
<td>vegetables</td>
<td>perennial green manure</td>
<td>perennial green manure</td>
</tr>
<tr>
<td>6.</td>
<td>vegetables/ green manure</td>
<td>perennial green manure</td>
<td>perennial green manure</td>
<td>vegetables</td>
<td>annual green manure</td>
<td>vegetables</td>
</tr>
</tbody>
</table>

On the Alanen farm, a reason for changing the existing crop rotation plan was the unbroken tufts of clover, grass and soil, that bothered the tillage and planting in July 1997. This prompted the idea of having vetch (*Vicia sp.*), instead of perennial green manure, as a preceding crop for chinese cabbage. This was the only time in the planning process that Antti thought of starting a more intensive rotation with annual green manures. Also Antti wanted to include rye in the rotation.
Before sowing the rye in autumn, the spring and summer season could be used for soil improvement by controlling perennial weeds and picking up stones, if necessary.

On August 15, the same year, the new crop rotation plan was shortly discussed during organic inspection. The inspector indirectly regarded Antti’s rotation plan with vetch as too short. In the telephone conversation of January 28, 1998, between myself and Antti, one of his main concerns was how to get rid of the unprofitable barley as a companion crop in establishing the leys. A separate rotation without potato or chinese cabbage was planned for some rocky, hilly or remote fields. The crop rotation planning was continued in another telephone conversation on February 2, 1998. On May 18, when I visited the farm, Antti’s plan was ready. The new innovation was to establish the ley to rye, without barley as a companion crop. The outcome, the five-year crop rotation, was:

1. Fallow and sowing of rye and grass
2. Rye and sowing of clover
3. Ley
4. Ley and chinese cabbage
5. Potato

7. The dynamics of object construction in planning crop rotations

In figures 2 and 3, the ideas of resource use and customer-orientedness in the planning discussions are represented as arrows. The arrows are numbered in the temporal sequence the ideas appeared in the discussion. In this paper, I shall describe and discuss only those ideas in the planning discussion that were moving the object to opposing directions of the same dimension. On the Kola farm, the dimension is the sustainability in resource use (arrows 1, 2, 4, 5 and 7 in figure 2). On the Alanen farm, the dimension of entrepreneurship and customer orientedness was the contradictory one (arrows 3, 4, 7, 8, 9 and 10 in figure 3).

For Maria and Kai Kola, it was natural to take into consideration the customers’ demand in their planning. They wanted to increase the vegetable acreage of the farm. Because vegetables are mainly crops requiring a lot of nutrients and labor, an increase in the vegetable fields means intensification in the resource use, and thus a move towards left in the framework (arrow 1, figure 2). The advisor was more cautious of increasing the vegetable acreage:

Advisor: Then if you increase [vegetable] land, it would be in the long run quite an exhausting rotation.

Maria: Yes I know that, and therefore I want us to ponder whether it is of any use to do it.

(27.3.1998)

Fig. 2. Dynamics of object construction in planning the crop rotation on the Kola farm.

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4 Ley here means perennial green manure, the yield of which is sometimes exchanged to farmyard manure with cattle farmers, but is mainly used for fertilization and soil improvement purposes.
Rather, the advisor thought it was important to have enough green manures in the crop rotation. She suggested rotations with perennial green manures, while Maria preferred annual ones:

Maria: And I see it at least so that, the experiences I have now from this vegetable farming, I would do it so, I don’t know what you think, but just as we talked that even though it would be perennial, so, so, [cultivating it] as annual green fallow so that it would be ploughed in the fall, or done something to it that in the following [year] a new one, even though you would have the [extra] seed costs, but anyway we would then get more biomass and nitrogen fixed there.

(Maria Kola 27.3.1998)

The question whether to use annual or perennial green manures was acute in the planning discussion. The two types of green manure partly serve different functions in the field. Roughly, annual green manures have a quicker fertilization effect, while perennial green manures contribute to the nutrient supply during a longer period of time, and are also more effective in improving the soil structure. In the planning discussion, the dilemma was partly solved by including both a two-year perennial ley and an annual green manure in the crop rotation plan made. In this sense, the new crop rotation plan with perennial green manure was a move to the right in the dimension of sustainability in resource use (arrow 7, figure 2).

The main argument of the advisor for the perennial green manures was to keep the field covered with vegetation. The farmers took seriously and joined the advisor’s concern about the crop coverage requirement, and the meaning of perennial green manures in it (arrow 2, fig. 2). Crop coverage is meant to reduce the nutrient load on water courses and to use efficiently the nutrients within the farming system. Besides perennial crops or green manures, the crop coverage can also be obtained by using so-called catch crops. The Kolas aim at producing early vegetables, after which it is relatively easy to sow rye as a catch crop. That way, the rye as a catch crop does not diminish the acreage within vegetable production (arrow 4, fig.2). Therefore, I have interpreted it as an initiative to the integrated type of object (fig.1).

One of the main ideas behind organic and sustainable farming is the efficient and sustained use of local resources. Earlier the Kolas had complemented the nutrient supply of their crops by farm-manure composts, the material of which was bought from local farmers. In the planning discussion, Maria and Kai Kola asked for an advice about the use a new fertilizer product manufactured from residues of food industry and imported to Finland from abroad. This is not an idea towards the normal conception of sustainable resource use and, therefore, it represents an arrow (5) to the left in figure 2. Altieri and Rosset (1995) distinguish between system redesign as a key principle in sustainable agriculture, and using inputs used in conventional farming. In the planning of crop rotation for the Kola farm, both of these opposing strategies were present.

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5 According to the Finnish General Agricultural Environment Protection Scheme, in Southern Finland, there must be a 30% crop coverage, or reduced tillage must be applied outside the growing season (Sirén 1999,67).

6 A catch crop means that some crops, like grasses or cereals, are sown in late summer only in order to collect nutrients, that otherwise would run the risk of being leached to the water courses.
At the moment of planning the crop rotation for the Alanen farm, there was demand for organic vegetables, and the local marketing company was encouraging the members to produce more vegetables. However, in the planning discussion, Antti repeatedly turned to rye cultivation instead of increasing his vegetable acreage. Rye seemed to be Antti’s intermediate alternative to solve the contradiction between profitable, soil-consuming vegetables, and non-profitable, soil-improving green manures (arrow 4, fig. 3).

With the stony fields of the Alanen farm, Antti felt he could not compete in price with farmers of better regions, and therefore he thought of diminishing the potato acreage to fit the local demand. In this sense, he was oriented towards customers (arrow 7, fig. 3). Antti’s idea of buying cheaper potato from other regions for his local customers is so customer-oriented that I have interpreted it to cross the border to another type of object (arrow 8, fig.3). The cultivation of early potato was also a market-oriented initiative (arrow 9, fig.3).

There are two initiatives in another direction. In the first one, Antti opposed the idea of cultivating red beet, although it had a good demand (fig.3, arrow 10).

Antti: Yes, the red beet obviously (laughter) is in demand, but no, no, there is not enough time for that.


Antti did not want to have a remote field plot in potato cultivation (arrow 3, fig. 3), although the plot would have suited the purpose very well. The reason was that he wanted to preserve a stopgap for the survival of the family.

Antti: (...) potato would surely grow there [in the remote field, LS] very well, there has not been, what was it, between fifties and sixties potato has been grown there. But, it would be there as some kind of stopgap then, if there will be some problems here [on home fields, LS], so you could get at least a small acreage of potato, for not to die of hunger yourself.

(Antti Alanen 28.1.1998)

This is oriented towards the old and fundamental self-sufficiency in agriculture, which contradicts entrepreneurship and customer-orientedness. Therefore, it crosses the border out of the framework of the study.
8. Conclusions

The ideas in crop rotation planning discussions show the potential alternatives in which directions the object of farming of the Kola and the Alanen farmers is moving. The analysis of the ideas in crop rotation planning discussions shows that farmers are pondering on multiple and contradictory choices in constructing their object. This views learning as creation rather than adoption. The Kola farmers, representing the horticultural historical path to organic vegetable farming, were pondering on ideas which represent contradictory directions within the dimension of sustainability in resource use. On the Alanen farm, with its history in conventional milk production, the dimension of the entrepreneurship and customer-orientedness was the contradictory one. These results suggest, that farmers with different histories have different learning challenges in organic vegetable farming.

The contradictions in the object of farming activity are of interest from the point of farmers’ learning. Contradictions by definition have to be solved in one way or another and, therefore, farmers actively work and put energy in solving them. This energy can be translated into change efforts by realizing that the object of farming activity is partly constructed by farmers themselves. The motive for change efforts arises from analyzing the contradictions and possibilities in the object and from projecting a new form of the object as a solution to contradictions (Engeström 1999, 66).

The presented contradictions can be looked at as parts of the historical evolution of Finnish agriculture and of organic vegetable farming. In Finland, the previously closed and protected sector of agriculture is opening increasingly and struggling to infuse its new entrepreneurial ways to integrate with the society, which represents a major learning challenge for farmers. With the ongoing specialization in organic vegetable farming, there is a tendency to evolve towards a more intensive use of resources, while the sustainability in resource use has partly been institutionalized by directives and regulations of organic farming.

References:


Societal Integration in Organic Vegetable Farming: Exploring the Learning Challenges
Societal integration in organic vegetable farming: exploring the learning challenges

Laura Seppänen*

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Abstract

Changes in agriculture and organic production bring farmers new learning challenges. This paper concentrates on two questions concerning societal integration. What learning challenges are involved in the societal integration of Finnish farms deriving from different histories to organic vegetable farming? How can learning challenges in societal integration be identified and analyzed? The paper applies an activity theoretical approach. It is argued that significant learning in organic farming is based on the construction of learning challenges through local activity. First, working hypotheses based on historical analyses are developed. Tension in discussion data is then qualitatively analyzed. Learning challenges are identified from both the working hypotheses and instances of tension in the data. The most interesting findings, both in content and methodology, are the relations between the farms and their customers, other farmers and extension. How societal integration is associated with the use of natural resources is considered. Analysis of learning challenges helps farmers and others involved to see the historical development of every-day activities and their associated problems.

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Introduction

Environmental issues have increased public concern and support for alternative and sustainable agriculture, of which organic farming is an established and growing sector (Lampkin, 2000). Market expansion also favors the increase in organic agriculture in Europe and worldwide. However, learning organic farming is far from simple. It is a question of a systemic paradigm change to a totally new way of farming rather than just adopting new cultivation methods (de Buck et al, 2001). Transformation to more sustainable practices includes ecological and technical dimensions as well as social and organizational change (Leeuwis, 2000).

Learning and facilitation have often been key concepts in recent literature on agricultural research and development (Röling & Wagemakers, 1998; Cerf et al., 2000; Guijt et al., 2000). While a broad notion of learning would incorporate any change, learning can be understood as only replicating ideas promoted by educators, researchers, or government. Since neither of these extremes seems satisfactory, what is it that should be learnt? This paper contributes to the initial stage of learning, namely, what local learning challenges are and how they can be identified and analyzed. It is argued that significant learning in organic farming is based on formation of learning challenges in local activity. This paper is for agricultural researchers, educationists and extensionists interested in learning and those who want to promote learning in agricultural settings.

Since the integration of Finland into the European Union in 1995, the formerly protected agricultural sector has been changing rapidly. This paper is part of a larger study on Finnish organic vegetable farming (Seppänen, 2000a; 2000b). The previous stages of the study suggested that an important change was concerned with how farmers themselves relate to

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the world beyond the farm. There seemed to be a need for a qualitatively new type of societal integration. Farmers are now more responsible for building and maintaining their own contacts and societal relations than previously. ‘Societal’ here means the ‘totality of human relations’ (the Collins Dictionary of Sociology, 1995). The research questions of this paper are:
1. What are the most challenging links or relations in societal integration, in terms of learning?
2. How can learning challenges in societal integration be identified and analyzed?

Before attempting to answer these questions, it is necessary first to lay the theoretical ground, which also shows how learning is understood. In Section 2, the theory underpinning the study will be briefly presented. The historical working hypotheses about learning challenges in societal integration will be discussed in Section 3. History is necessary because learning challenges can be understood only in relation to the previous forms of activity. Section 4 describes the method which has been developed. Extensionists may benefit most from the findings and discussion of them (Sections 5 and 6). In the final section, conclusions will be drawn about the learning challenges identified.

Activity theory

According to the cultural-historical activity theory (Vygotsky, 1978; Leonťev, 1978; Engeström, 1987; Engeström et al., 1999; Chaiklin et al., 1999), human activity is collective and it consists of the actions of individuals. An activity is directed towards an object, which is transformed, both discursively and materially, into an outcome or a product. A communal motive is embedded in the object. Beside objects, activity involves the systemic structural elements of the subject, tools, rules, community and division of labor. Activities are considered in their historical context. The change and development of an activity and its object are precipitated by contradictions:

Because activities are not isolated units but are more like nodes in crossing hierarchies and networks, they are influenced by other activities and other changes in their environment. External influences change some elements of activities, causing imbalances between them. Activity theory uses the term contradiction to indicate a misfit within elements, between them, between different activities, or between different developmental phases of a single activity. Contradictions manifest themselves as problems, ruptures, breakdowns, clashes. Activity theory sees contradictions as sources of development; activities are virtually always in the process of working through contradictions. (Kuutti, 1996; 34).

The expansive cycle of learning used in this paper was first developed by Yrjö Engeström (1987) building on the work of Bateson (1972) and Davydov (1982). According to this model (Fig. 1), expansive learning in a collective activity system starts with a state of need. The ongoing pattern of activity is increasingly felt to be unsatisfactory but what is wanted is not yet known. The old form of activity becomes more difficult (step 2), which leads to a search for a new object and motive of activity (step 3). In step 4, the people within a certain activity start to change or modify their actions according to the new object. The old and new forms of activity exist simultaneously and disturb each other. The model of the expansive learning cycle, in its many modified forms, has been used both as an analytical research tool (Foot, 2001; 75) and as an instrument of intervention (Engeström et al., 1996). In Section 3, the cycle is applied to the activity of the Alanen and Kola organic vegetable farms.

The histories of the farms and the working hypotheses of the study

Leena and Antti Alanen’s farm was previously a conventional dairy farm, while the Kolas used to grow flowering annuals in greenhouses. Studies on organic agriculture have identified a conflict between organic ideology and market-oriented agribusiness (Buck et al., 1997; Allen & Kovach, 2000; Kirschenmann, 2000; Mononen, 2000). While the Alanen farm bears more resemblance to the former type and the Kola farm to the latter, both of these conflicting orientations are present on each farm. Table 1 shows the local histories of these farms by applying the expansive cycle of learning (Fig. 1).

Step 4 in table 1 shows what is new and what is old on these farms. When something new emerges, the older form of activity does not
Figure 1. Cycle of expansive learning.

Figure 2. Framework for the study of expansive learning in organic vegetable farming.
Alanen

1. Need state: loans from taking over the farm made the Alanens start potato production.

2. Double bind: the Alanens disliked the potato spraying thoroughly. Antti developed allergy to the animals and the profitability of the animal production fell.


4. Changing the practice: a group of organic farmers, the Alanens included, founded a marketing cooperation (hereafter called the Company). Leena started to work outside the farm in 1996. The Alanens attended courses, hired labor for the farm and rented new fields. Within the cycle, the old is the more continuous and more closed activity. The new activity is broader and integrated into the world outside the farm more than previously and in new ways.


Kola

1. Need state: the Kolas became tired of greenhouse production.

2. Double bind: there was too much work in greenhouse production, allergic ailments, and anticipation of a decline in demand for the flowering annuals.


4. Changing the practice: in 1996, the Kolas started with large-scale vegetable production and ended the greenhouse production the following year. The new activity is organic vegetable production, representing a complex, long-term and large-scale system based on ecological principles. The old is the conventional production of flowering annuals in greenhouses, representing the standardized, short-term and intensive form of cultivation.

5. Consolidating the new way of working: the Kolas wanted a new crop rotation plan and bought a lot of new machinery in 1998.

Table 1. Transformation of the farming activity of the Aleans and the Kolas

disappear at once, but continues to influence the activity. The contradictory objects of the Kola and the Alanen farms can be depicted as two dimensions (Fig. 2) which form the framework of the study (see Seppänen, 2000b; Seppänen, 2002). The general history of Finnish agriculture and organic farming is also present in these dimensions.

Two paragraphs below constitute the working hypotheses concerning learning challenges in the societal integration of these farms. These hypotheses are still rough. There is a need to understand what they mean in practical farming activity which is the purpose of the qualitative analysis of discussion data (Sections 4, 5 and 6).

The activity of the Alanen farm has spread further and involves even more contacts with people outside the farm than before. Based on an analysis of the local history (Seppänen, 2000c), many types of contact outside their village and region were new and challenging for the Alanen farm. According to Vesala and Rantanen (1999),
the relationship with customers and markets is the central problem in the construction of the entrepreneurial identity of Finnish farmers. The history of state-supported Finnish agriculture generally corroborates this assumption.

More than with societal integration, the contradiction between old and new on the Kola farm reflects changes in the use of natural resources (Table 1). However, the use of resources and societal integration are interrelated in many ways. The Kolas as horticultural entrepreneurs relate very well to their customers and markets. Moreover, the customers are an important part of the object and motive of their activity. The entrepreneurship of the Kolas is culturally different from agricultural farmers. The primary learning challenge for the Kola farm is cooperation with other farmers, a desideratum in organic farming.

**Data and method**

The data consists of two audiotaped crop rotation planning discussions. Since crop rotation has to consider the multiple elements of farming activity (Båth & Ögren, 1995; Koskimies & Hannukkala, 2000), this data provides a useful perspective on the learning challenges involved. Tension in societal integration, implicitly present in the discussion data, was explicitly analyzed. It was discussed with the farmers only later.

The data on the Kola farm from March 1998 (about 40,000 words) is from a meeting with Maria and Kai Kola, the advisor, and myself at the Kola farm. The Alalen data, from January-February 1998, consists of two telephone discussions (about 20,000 words) between Antti Alalen and myself. The crop-rotation planning discussions have been described more fully elsewhere (Seppänen, 2000a). The farming activity and its societal integration are taken as the point of view of the analysis. The method consists of four sequential analytic steps: 1. Identification of expressed needs, 2. Identification of links, 3. Formation of hybrid topics and 4. Categorization of links. Because of limitations on the length of this paper, it is not possible to describe the method and the careful analysis in detail.

1: In search of tension: expressed needs. There was an initial interest in extracting something from the data relevant to learning challenges. This was done by finding the expressed needs. The concept of a need comes from Leon'tev (1978, 54): a need directs and regulates activity, but this is possible only when a need meets an object that satisfies it. I identified five types of expressed need: questions, intentions, problems, dilemmas (Billig et al., 1988) and disagreements. The topics in which expressed needs appear in the data have been indicated.

2. In search of societal integration: links. Societal integration was identified in the data through links or contacts beyond the farms. These include individuals or groups of people, organizations and institutions. Hired labor is considered a link because the workers come from outside the farm and are occasional. Subsidies, administration and loans are counted as links because they represent societal links with the farms. Since public administration as a link seldom includes an active agent, I listed as links the sentences in which administrative rules are discussed, even when this is done in the passive voice. Markets, demand and customers are also counted as links whenever they were spoken about indirectly. The topics in which they appear were listed together with the links. The analysis of links was done independently from that of expressed needs.

3. Combining expressed needs with links: topics. The topics of the needs were cross-tabulated with the topics of the links; that is, those topics including both expressed needs and links were listed in a new table. Empirically, the topics tell us that something is "happening" in the various tasks and perspectives in organic vegetable production. A topic is related in activity-theoretical terms to actions or groups of actions within the farming activity. Topics are interpreted by a careful analysis of what the expressed need is oriented to, and serve as empirical units for further study.

4: Categorization of the links within hybrid topics. The multiple individual links appearing within the topics were grouped into the following categories: administration and subsidies; customers and demand; other farmers; extension, education and research; and others.

Analyzing societal integration requires knowledge of the role of the link in the topic
under discussion. Both the content and the form of the data text were considered in the development of the typology. First, the links were divided into seven types: 1. neutral links, 2. links within stories, 3. places, 4. links to whom unanswered questions are targeted, 5. potentiating, 6. restrictive and 7. other links.

<table>
<thead>
<tr>
<th>Alanen: Link group</th>
<th>The link potentiates</th>
<th>The link restricts</th>
<th>Farmers not ready for/ do not benefit from the link</th>
<th>Other</th>
</tr>
</thead>
<tbody>
<tr>
<td>Administration</td>
<td>9. Potato disease risk</td>
<td>5. The milk quota</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>22. Potato yields</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Subsidies</td>
<td>15. There should be some income</td>
<td></td>
<td>17. New easy crops?</td>
<td>19. Composting?</td>
</tr>
<tr>
<td></td>
<td>22. Potato yields</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Demand</td>
<td>7. Acreage and demand for Chinese cabbage</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Competing marketing cooperative</td>
<td>8. Acreage and demand for potato</td>
<td>8. Acreage and demand for potato</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>21. Chinese cabbage yields</td>
<td>24. Seedlings–buy or produce?</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>14. Chinese cabbage disease risk</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>20. Interest in nutrient leaching</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Other links: hired labor</td>
<td>2. Use of hired labor</td>
<td>2. Use of hired labor</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 2. ‘Potentiating’, ‘restrictive’ and ‘other’ types of link in the Alanen farm data. The topic numbers refer to their chronological order in the data.
concentrates on the analysis of the last three, the most relevant types of links.

If the links are talked about positively, or if they appear to advance the farming activity, they are interpreted as potentiating links. In these cases, the connection or interaction between the farm and the link seems to work or offer the farm some opportunity. Restrictive links, which are spoken of negatively, are divided into two subtypes depending on whether the restriction seems to come from the link or from the farmers, who are not ready for or cannot benefit from the opportunity offered by the link.

The topics not belonging to any of these six types are categorized as ‘other’. In most, the link is both potentiating and restricting because of conflicting goals in the topic. Section 5 shows the results within the ‘potentiating’, ‘restrictive’ and ‘other’ types (tables 2 and 3). The Alanens’ links are described first, then those of the Kolas.

Findings

Alanen: Administration and subsidies
In the data from the Alanen farm, public administration or agricultural bureaucracy was talked about very little. No administrative regulation influenced the crop rotation planned. There is a half sentence about bureaucracy restricting the Alanens’ farming activity (about not being able to sell the milk quota, topic 5, Table 2), but otherwise administration was treated positively. The subsidies revealed tension since they helped with new investments (topic 15) but, in topic 17, Antti Alanen opposed onion cultivation and its subsidies.

Customers and demand
The local customers buying potatoes from the Alanen farm always advanced farming activity and were spoken about positively (topics 8 and 22, Table 2). Topic 19, classified as ‘other’, strengthens the potentiating effect of the customers on the Alanen farm.

The demand for Chinese cabbage (topic 7) had been good and was potentiating. Still, when the Company was talked about simultaneously, the demand was restrictive. In topic 13, Antti opposed the idea of beetroot cultivation, despite the fact that there was demand for it. The quality sorting restricted the yield level (topic 21), but at the same time it was a potentiating precondition for the continuity of the demand.

The marketing Company was mostly seen as restrictive in the Alanen data. However, in topic 13, classified as ‘other’, the view of the Company is different, Antti Alanen looking at his own farming activity from the Company standpoint. While the Company was restrictive, Antti Alanen was a subject within it.

The competing marketing cooperative could sell much cheaper organic potato, and thus restricted the Alanens’ potato production (topic 8). Surprisingly the cooperative was also potentiating, since Antti saw the possibility of buying cheap potato from it for his own local customers.

Other farmers
On both farms, the data show instances of tension in the links with other farmers. Other farmers potentiated the Alanens in various ways. Interestingly, competition from other farmers is positive in the Alanen data. In topics 7 and 18, competing groups of other farmers, such as conventional Chinese cabbage growers, or early potato producers define a temporal or quality niche in the market that the Alanens could benefit from. In topics 4 and 24 Antti Alanen opposed farmer cooperation.

Extension, education and research
Extension both potentiated and restricted the Alanens’ activity, and Antti also opposed it. In the Alanens’ topics 3 ‘planning of crop rotation’, and 12 ‘more rye’, the potentiating link was the researcher, giving essential information. In topic 14, Antti first rejected a suggestion to contact a foreign advisor but later he agreed with it. In a project meeting, Antti had expressed his interest by inquiring about whether nutrients leached from his fields into the groundwater (topic 20). This is potentiating because it was his own positive initiative. In topic 16, he did not believe that the classroom type of education could teach the skills needed by his hired workers.

Other links
On the Alanen farm, hired labor both potentiated and restricted (topics 2 and 18, table 2). In topic 16, ‘supervision of hired labor’, the restrictive link is the worker who was unskilled in agricultural tasks and had to be coached just like a novice from the city.
**Kola: Administration**

In the Kola data, not only did administrative rules restrict independence, but seem to exemplify the way agriculture and organic farming is being introduced to the Kolas as a collection of bureaucratic rules. Administration clearly reveals tension in the Kola data (Table 3).

The winter coverage requirement (topic 8, Table 3) shows the challenging nature of administration. The Agri-environmental Scheme in southern Finland requires that a minimum of 30% of the arable land be covered by plants outside the growing season, or reduced tillage must be applied (Särnäkkö, 1999). The rationale is to avoid nutrients leaching into watercourses, which is considered a severe environmental problem. In the Kola data, the requirement of winter coverage was generally restrictive. However, this requirement is also treated in another way. The

<table>
<thead>
<tr>
<th>Kola: Link group</th>
<th>Link potentiates</th>
<th>Link restricts</th>
<th>Farmers not ready for/do not benefit from the link</th>
<th>Other</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Subsidies</strong></td>
<td>9. Requirement of 0.5 ha</td>
<td></td>
<td>9. Requirement of 0.5 ha</td>
<td>9. Requirement of 0.5 ha</td>
</tr>
<tr>
<td><strong>Customers</strong></td>
<td>1. Processing plans 11. Customer service</td>
<td></td>
<td></td>
<td>4. There are no products to sell</td>
</tr>
<tr>
<td><strong>Demand</strong></td>
<td>1. Processing plans 15. Yield and demand for beetroot</td>
<td>15. Yield and demand for beetroot</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Other links: Enterprises</strong></td>
<td>1. Processing plans 17. Interest in Biosol fertilizer</td>
<td></td>
<td></td>
<td>2. “I would not talk about the marketing channels”</td>
</tr>
</tbody>
</table>

*Table 3. 'Potentiating', 'restrictive' and 'other' types of link in the Kola farm data.*
Kolas put it into practice and it had an impact on the new crop rotation designed. The winter coverage requirement is learnt and it influenced the structure of the Kolas’ farming activity (classified as ‘other’). The subsidies seem to be confusing and thus constitute tension (topic 9, Table 3).

Customers and demand
Since customers were always talked about positively in the Kola data, this link did not create tension. At the time of the data collection, the Kolas were getting more and more customers and the problem was insufficient supplies of produce to sell (topic 4, Table 3). This topic demonstrates that customers were important and potentiating for the Kolas. The demand was also potentiating, except in one little topic (number 15, ‘Yield and demand for beetroot’). This is a brief comment by Kai Kola about the beetroot selling well in summer, but not so well in winter.

Other farmers
Other farmers both advanced and restricted the farming activity of the Kolas, who also opposed farmer cooperation. In topic 18 the Kolas were not able to obtain manure where they would have liked to (the link restricts). They had to buy compost and manure from other farmers, even though they preferred other arrangements.

In marketing and vegetable processing, the Kolas were planning a positive and enabling cooperative venture with another farmer family (topic 1). This enabled smaller acres to be dedicated to soil fertility improvement with green manures (topic 10). Other farmers gave the Kolas’ customers the opportunity to obtain products (topic 3), but Maria Kola mentioned their bad experience of buying potatoes of poor quality from other farmers.

Extension, education and research
In the Kola data, extension, education and research usually potentiate or questions are targeted towards these links. There are two topics that create tension in this link group. The link in topic 21, ‘product quality control and education’, is a course organized by advisory services for farmers for control of the product quality of vegetables. It is potentiating because the Kolas need it for their forthcoming crops, and because Maria Kola is willing and able to participate.

However, within the same topic, Maria Kola said she was tired of participating, which I have interpreted as not being ready for the link.

In topic 23, the advisor asked whether the Kolas needed some assistance in managing the crop rotation plan. This meant long-term advice about green manures, perennial weeds, etcetera. Maria Kola did not want instructions of this kind because they already had a lot of literature from various educational events. Later in the meeting, Maria asked if there were any instructions for the growing organic lettuce and zucchini. Neither the advisor nor I could give her what she wanted in Finnish (a restriction). I will come back to this topic in Section 6.

Other links: enterprises
Other enterprises are potentiating in the Kola data (topics 1 and 17). Topic 2, classified as ‘other’, also strengthens the potentiating nature of the enterprise links. In the following section, some instances of tension in societal integration will be discussed together with the working hypotheses outlined in Section 3.

Discussion

Public administration
That administration in the Alalen data is discussed in such positive terms may be because agriculture has been protected by the state in recent Finnish history. Administration could be seen as a protector of farmers.

On the Kola farm, the previous greenhouse production activity was much less regulated than their new organic vegetable production. Now they had to learn to cope with multiple administrative programs and rules. This was difficult particularly because independent entrepreneurship was important for the Kolas. Even though administration and subsidies were not explicit in the working hypotheses, they are historically understandable as learning challenges.

Figure 3 highlights the difference between these farms in topics related to nutrient leaching. The Kolas’ topic 8, ‘winter coverage requirement’, although restrictive, was very well observed in crop rotation planning, and is therefore placed high in Figure 3, as is the Alalen topic 20, in
which Antti expressed his interest in knowing how much nutrient would seep into the groundwater from his fields. What differentiates the farms in these topics is the quality of societal integration. For the Kolas, there was an administrative rule to be followed. For the Alanens, the interest in groundwater was Antti's initiative, expressed in a meeting of educators and extensionists.

**Customers and demand**

For the Alanens, production seems to be more important than customers. Surprisingly, talk about customers did not reveal tension in the Alanen data. The customers with whom the Alanens had direct contact were entirely potentiating in the data.

Why is the marketing Company so restrictive in the Alanen data? In Finland, marketing cooperation between agricultural and horticultural producers has been long neglected. The independence of the farms and horticultural enterprises was strong during the 'good times' of the 1970s and the 1980s, with no need for marketing cooperation (Ylitalo 1997, 9). Now, cooperation is increasingly necessary for success in marketing by vegetable growers (Runsten, 1999). The Company of which the Alanens were members, was necessary for selling organic vegetables to wholesale markets. Still, at the same time it distanced farmers from their customers and made communication more difficult. These findings indicate the importance of direct contact between farmers and customers as a way of learning no matter how marketing is organized.

According to Duram (2000) and de Buck et al. (2001), market developments and stability are concerns of organic farmers. In Finnish organic vegetable production, marketing channels are still developing and the volume of production may vary considerably from one year to another. How, then, do farmers get information about demand? One way is by communication with actual or potential customers, as suggested above. Obtaining information about the demand for organic vegetables is an urgent question of cooperation and organization.

The potentiating nature of customers and demand in the Kola data is understandable against the background of their market-driven history of selling flowers. Horticulture in Finland has been culturally shaped by the law of supply and demand. In the crop-rotation planning of the Kolas, the customers seemed to come first, production being tailored to their needs.

**Other farmers, hired labor and enterprises**

Since the Alanens related naturally to their overall societal integration:

- Administration
- Education and extension

**Alanen: interest in nutrient leaching**

**Kola: winter coverage requirement**

- Short-term and intensive use of resources
- Independence and self-sufficiency
- Avoidance of nutrient leaching
  - Ecological and sustained use of resources

*Figure 3. Topics 8 (Table 3) of the Kolas and 20 (Table 2) of the Alanens interpreted in the framework of the study.*
village community and to other farmers in the region other farmers ought not to have been a learning challenge in the Alanen data. How, then, should we understand this instance of tension?

It is first necessary to take a look at the topics where Antti opposed farmer cooperation. In topic 4 (Table 2), Antti wanted to get rid of the companion crop and the farmer cooperation relating to it. In the topic on seedlings (24, Table 2) Antti was pondering the dilemma of whether they should produce seedlings on the farm or buy them from other farmers.

These topics can be seen in the context of the developing specialization within organic agriculture, which requires increasing division of labor among farmers and other actors. In both of these topics, Antti Alanen was opposing the division of labor. On the topic of seedlings, he opposed increased specialization as well. In this sense, the Alanens were heading more towards self-sufficiency and independence (downwards in Figure 2) rather than integrating with other farmers.

The links with other farmers can be considered together with the Alanens’ link with their hired labor (topics 2, 16 and 18). In the old days, people from the village occasionally worked on the farm and were well looked after. Today, hired labor is needed more than ever, but most workers come from outside the village. The old way of relating to hired labor is no longer sufficient. The tension apparent in the links with hired labor and other farmers can be understood as a desire to maintain the old rural way of life and the village community. Simultaneously there is a wish to dispense with it and gain more independence. In further research on farmer cooperation, it would be useful to consider the cultural context and the changes occurring.

In their earlier greenhouse production, the Kolas were tied to commercial enterprises when buying production inputs. Cooperation with other farmers would thus be difficult for the Kolas. My analysis confirms that this was indeed so. Topics 17 and 18, ‘interest in Biosol-fertilizer’ and ‘compost and manure’, exemplify this challenge (Fig. 4).

The advisor and I asked questions about the compost and manure the Kolas bought from local farmers. Since the Kolas talked negatively about them, this link is placed low on the dimension of societal integration (Fig. 4). The Kolas were positively interested in using a new fertilizer, Biosol, imported from Austria. The topics ‘interest in Biosol fertilizer’ and ‘compost and manure’.

Societal integration:

![Diagram showing links between commercial international enterprises, local and commercial farmer cooperation, interest in Biosol fertilizer, locality in resource use, short-term and intensive use of resources, independence and self-sufficiency, and ecological and sustained use of resources.]

Figure 4. Topics 17 and 18 (Table 3) of the Kola farm interpreted in the framework of the study.
manure' differ in terms of locality, the local use of resources being stressed in organic farming (IFOAM, 2001), and in sustainable agriculture and food systems (Kloppenburg et al., 1996). They also differ in the forms of societal integration. Buying Biosol would involve the Kolas with international commercial and professional enterprises. This link would maintain the same pattern of exchange between commercial enterprises as in their previous greenhouse production. Buying compost and manure is another type of societal integration – a commercial link with local farmers. This would suit the organic ideology better, but for the Kolas, it means learning a new type of relation.

**Extension, education and research**

'Farming instructions', the Kolas' topic 23, shows how there was insufficient information about organic vegetable production for farmers in 1998. The advisor was about to prepare instructions for crop rotation, which were not yet available. Instructions about the zucchini and lettuce were also lacking. This highlights a task and a learning challenge for extension, education and research in organic agriculture. The topic 23 reveals a contradiction of the Kolas, depicted in Table 1 and in the horizontal dimension in Figure 2. The instructions about the zucchini and lettuce correspond to the short-term and annual side of this dimension. The Kolas were familiar with this and wanted more instructions of this type. The crop-rotational instructions offered by the advisor correspond to long-term and ecological management of the field system, and the Kolas rejected them. For the Kolas, the challenge of a new type of resource use was connected with extension.

**Conclusion**

The main methodological point in this study is that learning challenges cannot be interpreted simply by analysis of crop rotation planning discussions. Learning challenges are defined in

<table>
<thead>
<tr>
<th>Link group</th>
<th>Alanen Working hypothesis</th>
<th>Tension in the data</th>
<th>Kola Working hypothesis</th>
<th>Tension in the data</th>
</tr>
</thead>
<tbody>
<tr>
<td>Administration</td>
<td>–</td>
<td>yes</td>
<td>–</td>
<td>YES</td>
</tr>
<tr>
<td>Subsidies</td>
<td>–</td>
<td>YES</td>
<td>NO</td>
<td>YES</td>
</tr>
<tr>
<td>Customers</td>
<td>YES</td>
<td>NO</td>
<td>NO</td>
<td>NO</td>
</tr>
<tr>
<td>Demand</td>
<td>YES</td>
<td>YES</td>
<td></td>
<td>yes</td>
</tr>
<tr>
<td>Company</td>
<td>YES</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Competing marketing companies</td>
<td>–</td>
<td>YES</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Other farmers</td>
<td>NO</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
</tr>
<tr>
<td>Extension, education and research</td>
<td>YES</td>
<td>YES</td>
<td>NO</td>
<td>YES</td>
</tr>
<tr>
<td>Other Alanen: hired labor</td>
<td>YES</td>
<td>YES</td>
<td>NO</td>
<td>NO</td>
</tr>
<tr>
<td>Kola: enterprises</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 4. Working hypotheses and tension in the societal integration of the Alanen and Kola farms. The rows with lines in working hypotheses mean that these links were not considered before the data analysis. A 'yes' in small letters mean that there was only some slight tension found in the data. The shaded rows are those where there is a discrepancy between the working hypotheses and instances of tension.
relation to the previous historical forms of activity. This paper incorporates history into the
analysis with the working hypotheses. Table 4 presents the hypotheses in a more detailed form
than Section 3.

The qualitative analysis of data revealed that
most of the link groups showed tension in
societal integration (Table 4). In some groups the
tension in the data was only a minor one – this is
shown as ‘yes’ with small letters (see
administration in the Alainen data, and demand in
the Kola data, in Table 4, and in Section 5). My
interpretation is that they do not show a learning
challenge.

The working hypotheses suggested that neither
other farmers on the Alainen farm nor extension,
education and research on the Kola farm would
present a learning challenge, and that customers
on the Alainen farm would. Tension in the data
show the opposite (see shaded rows in Table 4).
These instances of tension require the working
hypotheses to be reconsidered and changed. The
data analysis also revealed new links, such as
administration and subsidies that were not
considered in the working hypotheses (marked as
lines in the working hypotheses in Table 4).

The learning challenges of the Alainens were
subsidies, demand and marketing organizations,
other farmers, extension, education and research
and hired labor. The learning challenges of the
Kolas were public administration and subsidies,
other farmers, and extension, education and
research.

The topics shown and analyzed in Sections 5 and
6 explain how these learning challenges, all with
different qualities, became apparent in practical
farming activity. Why is it of use to identify and
analyze them? In the rapidly changing situation
agriculture finds itself in, analysis of learning
challenges helps farmers and other actors see the
historical development of everyday activities and
their problems. Learning challenges require
efforts to change. Since farmers are the clients of
advisors, their learning challenges are important
for the development of extension services as well
as other agricultural activity systems.

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III

Farming across the Years: Temporal and Spatial Dimensions in Learning Organic Farming
FARMING ACROSS THE YEARS: TEMPORAL AND SPATIAL DIMENSIONS OF LEARNING ORGANIC FARMING

L. Seppänen & H. Koskimies

Abstract
In organic farming, it is generally accepted that a long-term perspective spanning across the years is necessary for the sustainability of organic field management. This paper analyzes the crossing over of annual boundaries during an organic inspection in an attempt to show how the long-term perspective is learnt in the practical organic vegetable farming. Within the speech turns that refer across the years, two main topics emerged. The first is the nutrient management, which was connected with plant growth and environmental regulations. The second is the sequence of crop rotation, appearing both as a list, detached from the fields, and as a temporal process of the fields. A weed problem, caused by couch grass, was repeatedly referred to by the farmer. It was not addressed at all from the several years’ perspective. The results suggest that the nutrient issue within the administrative rules heavily impacts on organic farming. This leaves other important issues concerning production, such as the long-term weed management, with little emphasis. Reasons for this are discussed in the context of the sustainability of environment and production. Crossing over temporal boundaries is linked with many other boundaries.

1. Introduction
The temporal dimension of actual, specialized agriculture varies according to the type of production. Production of milk, beef, or perennial crops proceeds in long cycles of years, while chicken production or some forms of greenhouse growing enjoy many productional cycles per year. In arable farming, such as cereals or vegetables, a common productional time unit is a growing season, starting from the sowing time in spring and ending in autumn in harvesting and garnering the income from the yield.

The concept of sustainability, often present in debates on the use of natural resources, does not have a consensus of its meaning. The word sustainable is derived from the Latin sustinere, meaning to keep in existence, implying permanence or long-term support. (Rigby and Cáceres, 2001). The temporal dimension of an activity is, therefore, implicit in the concept of sustainability. The idea of the paper is not to argue about the sustainability of organic farming, but, rather, that a long-term perspective is necessary for organic farming for it to be sustainable. This is due to the fact that many of the natural processes take longer than the one-year production cycle prevalent in vegetable and cereal production. Biological nitrogen fixation, plant diseases, soil structure and perennial weeds are examples of these natural processes. In organic farming, where synthetic pesticides or soluble fertilizers are not used, a long-term perspective is required for the management of these natural processes of the field. The interest of this paper is especially in underlying the importance of crossing the limits of the annual production cycle, either to the previous or to the following year(s) to come. This is called “farming across the years”. From the point of sustainability, it is of interest to examine how learning a new perspective that crosses over the years occurs in the organic farming practice. Besides organic
farming, it is assumed that learning to act across the years is necessary for learning many other sustainable farming practices as well.

In this paper, learning is means crossing the usual boundaries. The notions of “learning” and “boundary” are connected in two ways. First, the organic inspection under study here is a place for boundary crossing between the activity systems (Engeström, Engeström & Kärkkäinen, 1995) of the farm and the inspection body, which offers learning potential for both the farm and the inspector. The way the organic inspection is done shapes how organic farming is understood and what is considered important in it. Second, as stated above, crossing the annual boundaries indicates learning the long time perspective necessary in crop rotations and organic farming. Crossing the boundaries can also be a process of reconstructing boundaries (Kerosuo, 2001). Besides farmers, the new time perspective may be present challenge for inspectors as well. Crossing some cognitive boundaries, such as the time dimension here, may reveal a web of interconnected boundaries, all of which require learning effort.

The temporal expansion of the farming object also has spatial implications. Crops are planted in a certain sequence thus increasing diversity. Parts of the fields are being used for green manures mainly for fertilizing or soil improvement purposes. Historically, organic farming has been associated with small, self-sufficient family farms where animal and crop production existed side by side and where clovers and grasses had economic significance as fodder. Organic vegetable farming is developing from craft towards specialized, large-scale production: in vegetable farms, the fields with green manure are there only to benefit farming in the following years, especially in specialized agricultural regions with only little animal husbandry.

In this paper, “green manure” refers to those fields where either annual or perennial grasses and nitrogen-fixing plants are grown for soil improvement and fertilization purposes. A “fallow” refers to a field which is repeatedly tilled to combat the weeds. Most often there is a fallow during early summer, which is later sown as a green manure or grass.

The research questions are:
1. To what extent, and how, are the annual boundaries crossed during an organic inspection?
2. What is the implication of this for learning to farm across the years?

This paper studies an inspection of one farm, and thus we do not claim the findings to be common to all organic farms. However, we argue that the analysis of local and real practices may bring new perspectives to the discussion about organic farming and help inspectors and advisors in their developmental efforts.

2. Organic inspection and the Kola farm
The organic inspection in Finland, organized by state authorities, is obligatory for all organic farms, every year, and it is normally carried out during the summer of full growth. The inspection of the Kola farm in 1998, videotaped and transcribed, comprises the empirical data of this paper.

Here, the inspection data is analyzed from a learning point of view. There are various reasons for this. First, the inspection is part of a real practice, as the every-day learning of the farmers, that offers them a chance for reflection on their farming. Second, organic farming is still a relatively new and rapidly evolving sector, and there are new things to learn especially for beginners. Therefore, many problems of the farmers are taken up during organic inspections. The field walk of this particular organic inspection contained many problem-solving situations, indeed. For some farmers, organic inspection may be one of the few opportunities to talk about their fields
and farming with anyone knowledgeable in organic farming. Farmers have to pay for both the advisory services and organic inspections. Often times organic inspections are carried out by organic advisors.

The Kola farm was earlier engaged in the production of flowering annuals in greenhouses. In 1991, they converted their fields (3.5 hectares) to organic farming, and the production of organic vegetables increased little by little. The Kolas obtained supermarkets as their new customers and, in 1996, acquired by rent an additional 5.5 hectares of fields. The greenhouse production continued until 1997. The production season of the data, in 1998, was the first one to build economically only on organic vegetable farming. They had larger acreages of vegetables than ever, in the effort of becoming a relatively large-scale and mechanized farm specialized in organic vegetables. The shift in temporal dimension from a greenhouse production with three productional cycles per year to farming with cycles extending across the years, was one of their major challenges in learning organic farming (Seppänen, 2002).

The region where the Kolas live is specialized in cereal production. In cereal farming, where a common productional unit is one growing season, learning organic farming may bring changes in the temporal dimension. An advisor, experienced in both organic and conventional agriculture, expressed the challenge of farming across the years like this: An organic farmer must always look ahead for over at least one year, when choosing, for instance, crops for the next growing season, while in the conventional production, solutions can be made for one growing season only (Partanen, 1999). The Kola farm had to learn not only organic, but to manage change from greenhouse production to open field cultivation as well. The challenge that crossing the annual boundaries clearly presents to the Kola farm, may be a slight one to other farms.

3. Findings: Farming across the years
Unfortunately, the weather in 1998 was extremely bad and rainy, causing the Kolas much trouble, work and stress. Table 1 shows the route of the organic inspection. It started from the Kola house and went around all the fields. In the end, the inspection papers with acreages, important from the point of view of the subsidies paid, were filled in in the house. There, the discussion had another a more inspection-like character. The field visit provides roughly 2/3 and the inspection discussion in the house 1/3 of the discussion data. The discussion data is divided according to the place where the discussion occurred, because most often the place structures the conversation. A speech turn, a basic unit in Table 1, means a sentence or sentences said by a person, which is, in most cases, preceded and followed by talk of other persons in the discussion.

Field plots 3-10, owned by the Kolas, had smaller acreages than the rented fields 12-18. However, the latter received fewer comments than the fields owned by the farmers.

In Table 1, three columns on the right show the number of turns of the discussion where references to farming across the years appears. Only less than seven per cent of the data shows that kind of speech. The column “Ongoing 1998” includes speech referring to that particular growing season. Sometimes the discussion is about something in general where no time perspective can be recognized. These turns are also categorized in the column “Ongoing 1998”.

Column B lists speech turns that refer across the years, but what happened in the past, or will happen in the future, is not linked in the discussion with the ongoing growing season under study. A very common topic in this category is the preceding crop, inquired after by the inspector or commented on by the farmer herself.
Table 1. Speech turns referring across the years in the discussion during the organic inspection on the Kola farm, 1998. The numbers refer to turns of talk in the data.

<table>
<thead>
<tr>
<th>Place</th>
<th>Now</th>
<th>Speech referring across the years</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>A. Ongoing 1998</td>
<td>B: no link to “now”</td>
</tr>
<tr>
<td>1. The Kola house</td>
<td>103 turns</td>
<td></td>
</tr>
<tr>
<td>2. On the way to the field</td>
<td>45</td>
<td>5</td>
</tr>
<tr>
<td>Field 3: Carrot 0.30 ha</td>
<td>174</td>
<td>11</td>
</tr>
<tr>
<td>Field 4: Carrot and red beet 0.35 ha</td>
<td>99</td>
<td></td>
</tr>
<tr>
<td>Field 5: Onion 1.65 ha</td>
<td>103</td>
<td>30</td>
</tr>
<tr>
<td>Field 6: Various 0.13 ha</td>
<td>132</td>
<td></td>
</tr>
<tr>
<td>Field 7: Red clover and ryegrass 0.25 ha</td>
<td>142</td>
<td>11</td>
</tr>
<tr>
<td>Field 8: Berries 0.14 ha</td>
<td>145</td>
<td>14</td>
</tr>
<tr>
<td>Field 9: Potato 0.40 ha</td>
<td>171</td>
<td></td>
</tr>
<tr>
<td>Field 10: Storage and packing hall</td>
<td>286</td>
<td></td>
</tr>
<tr>
<td>11. On the way to hired fields</td>
<td>85</td>
<td>2</td>
</tr>
<tr>
<td>Field 12: Potato and swede 0.30 ha</td>
<td>66</td>
<td>9</td>
</tr>
<tr>
<td>Field 13: Vetch and ryegrass 1.62 ha</td>
<td>51</td>
<td>4</td>
</tr>
<tr>
<td>Field 14: Carrot 0.58 ha</td>
<td>44</td>
<td>2</td>
</tr>
<tr>
<td>Field 15: Leek and potato 1.10 ha</td>
<td>66</td>
<td>4</td>
</tr>
<tr>
<td>16. On the way to next field</td>
<td>90</td>
<td></td>
</tr>
<tr>
<td>Field 17: Fallow 1.07 ha</td>
<td>40</td>
<td>11</td>
</tr>
<tr>
<td>Field 18: Red clover and timothy 0.46 ha</td>
<td>35</td>
<td>11</td>
</tr>
<tr>
<td>19. On the way to the house</td>
<td>217</td>
<td>3</td>
</tr>
<tr>
<td>20. The Kola house</td>
<td>1358</td>
<td>14</td>
</tr>
<tr>
<td>Altogether 3 687 turns</td>
<td>3452</td>
<td>85 turns 2.3%</td>
</tr>
</tbody>
</table>

Column C, Table 1, shows those pieces of data where the speech referring across the years is connected to the “now” situation of the present growing season. From the point of learning to farm across the years, this category is the most interesting one. It deals with the crop sequence, nutrients and plant growth, the yield, weeds or pests of the crops. Both the inspector and the farmer form these linkages between the “now” and the longer time perspective, showing that farming across the years has been learnt at least to some extent. Column D includes the speech across the years that concerns neither crop rotation nor field management. The topics in column
D include previous activities of the farmers, the use of small investments in the future, about renting fields, traffic, cooperation of organic farmers, administrative issues, etc.

The challenge in organic farming of extending the perspective across the years is about crop rotation and related field management issues such as the use of biological nitrogen fixation, improvement of soil structure, and suppression of plant diseases and perennial weeds. Therefore, the analysis concentrates on these questions (columns B and C in table 1). Field management issues were discussed during the field walk (rows 2-19, Table 1) and crop rotation was also handled in the Kola house (row 20, Table 1).

However, the categorization like the one in Table 1 loses the context of each of the field plots. Our assumption is that the field context determines the quality and quantity of the issues across the years that should be discussed. The farmer and the inspector, walking around the fields together, communicate not only with each other but also with everything they see in each of the field plots. Vision and classification are accomplished through encompassing activities, talk, objects and images (see Goodwin, 2000a, Goodwin, 2000b). It is not possible properly to analyze the discussion data without taking into consideration the situation in the field plot under discussion. Therefore, we will analyze more in detail some of the small “visits” to the field plots and show four examples: 1. speech referring across the years was not present although there was a need for it, 2. speech across the years was present but not linked to the actual situation, and 3. speech across the years with a link to the ongoing production season. The fourth concerned the crop sequence of the rotation.

Example 1 is from Field 15 growing leek. This crop was apparently new to the inspector and she asked if the Kolas had cultivated it previously (this is the speech across the years that is seen in Table 1, Column B, Field 15. The two turns in Column C deal with potato). The planting and fertilization of the leek were discussed. The farmer related that the couch-grass problem had caused them a lot of manual weeding. Annual techniques such as flaming, hilling and soil tillage were referred to in relation to weeds. It was not discussed, why the field got infected with the couch grass during the previous years, and what could be done to avoid it next year. The couch grass is a perennial weed that shows the need for a perspective spanning across the years in organic farming.

In Example 2 from Field 14, growing carrot, the link across the years is made. After stating that the carrot was not at all fertilized in spring, the farmer crossed the annual boundary by mentioning the preceding crop, a two-year clover grass that had been growing very well.

Excerpt 1. (All the excerpts are translated from Finnish by L. Seppänen).
Farmer: This is, you know, land that was not fertilized at all in the spring. It was a strong, two-year clover grass growing here (…) and [the carrot has] been totally under water, it is a wonder it survives…

The farmer described the wetness of the field and was amazed at how well the carrot was growing, despite the abundance of rain water on the field. Clover grass is a good preceding crop, in that, besides fertilizing, it also improves soil structure to make it better tolerate flooding. The way the farmer was taken by the growth of the carrot suggests that she did not link it to the effect of the clover grass from the previous year.

From the point of farming across the years, the field plots under green manures for fertilizing or soil improvement purposes are interesting, because their land use is meant to benefit farming in the coming years. That is, the temporal challenge is spatially well seen in the use of green...
manures or fallows. Example 3 comes from Field 17 that lies fallow, infested with couch grass. Entering the field, the farmer said:

Excerpt 2.
Farmer: Here, I don’t know what would be worth doing here, we have tried to keep this an open fallow, because the couch grass problem is so terrible…

However, nine days before the inspection, the Kola farmer had been able to plough the field plot and to hoe it a little later. Therefore, during the inspection, neither couch grass nor other weeds could be seen above the ground.

Excerpt 3.
Inspector: So, this looks really neat…

For the inspector, the field looked fine. No couch grass in sight! In the following conversation, the farmer asked her question twice more. But then, it had a slightly different bias:

Excerpt 4.
Farmer: Now, we intend to put here – (sigh) – whatever we should then put here for the winter?

The question here was no longer about couch grass. There is the assumption that something should be sown to that field for the winter time - which is much influenced by the fact that for the autumn, according to the administrative winter-coverage requirement as part of the Agri-Environmental Scheme, 30% of the fields should be covered with vegetation during autumn and winter. This obligation had been discussed previously in the inspection of other fields. In fact a reduced tillage on vegetable fields would have been enough to fulfill the winter-coverage requirement, but obviously the inspector as well as the farmer followed the stricter part of the rule.

Sowing rye was suggested as a solution for field 17. Then, there is a leap backwards across the years: the inspector investigates the preceding crop and its fertilization. However, this is not done for combating the couch grass but for discovering whether rye would have sufficient nutrients, or “growing power”. The problem of couch grass, posed by the farmer, turns into a question of nutrient conditions for the growth of the rye. It is possible that the inspector was thinking of how well the rye would compete with couch grass although the rest of the inspection data do not confirm this line of thought.

The fourth example is about the crop sequence, Field 18, where red clover and ryegrass had been sown in the spring, without a companion crop. The farmer started by saying that the field with its sandy soil would be ideal for growing carrot.

Excerpt 5.
Inspector: You have not yet had carrot here?
Farmer: No.
Inspector: Any intention for it next year?
Farmer: No, it will be clover…
Inspector: Yes, yes, but after that?
(…)
Farmer: (to herself) It will be clover here. Yes, we had potato here…
Inspector: Yes?
Farmer: …last year, it was so beautiful Nicola [potato variety]…
In excerpt 5, the farmer was “tasting”, learning by means of inner dialogue, the sequence of crops planned for this field. Even though the crop rotation plan, obliged by agricultural administration is made for five years, the most essential leaps across the years are to the previous and the following years. The carrot planned for two years ahead was still far away.

At the end of the inspection, the documents were filled in in the house (Table 1). The question about the crop rotation was then given as a sequence in both discussion and inspection documents (Table 2).

Table 2. The crop rotation plan of the Kola farm, as expressed in the inspection document, 1998.

<table>
<thead>
<tr>
<th>Table 2. The crop rotation plan of the Kola farm, as expressed in the inspection document, 1998.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Six-year crop rotation: clover I-II, vegetables, root vegetables, green manure, vegetables.</td>
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4. Discussion

Boundary 1: Time dimension

The time perspective within the organic inspection remained mostly within the limits of the ongoing growing season. The inspection is more about the detection of malpractice in organic production than finding shortages in the professional skills of the farmers. The crop rotational perspective is, perhaps erroneously, implicitly expected to be part of the expertise of farmers after having converted to the organic. The issues of nutrient management and perennial weeds of this study show the need to cross the annual boundaries in organic farming. The new time perspective, being a challenge for the inspectors as well, may take long to learn.

Such speech across the years that concerned with the field management was rather marginal in quantity (Table 1). Nevertheless, it shows that farming across the years has been learnt at least to some extent, and that it is likely to promote overcoming annual boundaries. Time-related considerations jump most often to the previous or next year. The nearest annual boundaries are the most crucial ones.

The temporal expansion in organic farming is not only a linear extension of time: it also includes changes in the short-term farming. The organic-cultivation techniques of vegetable production are not standardized, because they are built up in the local conditions of the field and farm. Taking care of the vegetable fields has to be synchronized with the management of green manures and fallows in the every-day practice of the farmers. The field conditions have a changing life of their own. Besides the long-term perspective also improvisation and quick action are needed (Engeström et al., 2001).

The analysis of farming across the years revealed a web of other boundaries that have to be managed simultaneously with the time boundary. Some of these are taken up below.

Boundary 2: How to see the fields?

The inspector was seeing the fields of the Kola farm for a first time. According to the actual inspection regulation, one inspector can inspect only twice one and the same farm. After that, another inspector will succeed. This leads inspectors to acquaint themselves with those things that are easy and clear to work with, such as nutrient management or bookkeeping.

In the third example of this paper, the Kolas had ploughed Field 17 that had the problem with the couch grass. However, ploughing did not solve the problem: the weed remained in the lower
layers of the soil, to reappear and grow on later again. The inspector could only see a well-ploughed soil, free from weeds, which could mislead her from taking seriously the problem posed by the farmer. How to see the fields has an impact on the recommendations and actions taken. Example 3 shows that the inspector was “discussing” more with the field than with the farmer.

Boundary 3: Crop sequence, in the fields or on paper?
When filling in the inspection documents at the Kola house, crop rotation was talked about as an abstract sequence (Table 2). Thus, it may remain untouched by what actually happens in the fields. It seems that crop rotations are difficult to inspect. In this inspection, the crop sequence was discussed, to some extent, in the fields, as well. Excerpt 5 shows how the farmer was learning this sequence in Field 18 by converting the sequence to a process on her field plot. The question often repeated in the fields of “what was growing here last year?” may help farming expand the vision across the years.

The crop sequence clearly supports farming across the years by giving a necessary framework. The crop rotation has an administrative aspect, too. An accepted crop-rotation plan for the next five years is a precondition for passing as an organic producer (Heinonen & Kieksti, 1998). An institutionally stabilized way of tailoring crop-rotation plans for each organic farm is an important tool in learning to farm across the years. But, at the same time, this administrative nature of the crop-rotation plan is a weakness, possibly making it a rule that has to be followed. The bureaucracy around crop rotation plans can even prevent farmers from learning to rely on their experiences and flexibly re-planning their own land use.

The crop rotation as administrative practice focuses on the future. However, the boundary to be crossed may be the one to the past, as well. Understanding the historical development of the fields gives good grounds for planning and implementing both current and future actions. This is especially important now when many farmers have newly rented or bought fields they are unfamiliar with. It would be useful to add more than one preceding crop to organic inspection documents.

Boundary no. 4: Between nutrients and weeds
The nutrient question was prominent in the speech across the years. It focused either on plant growth or on environmental concerns in the form of protecting the waters and water habitats. In the case of the Kola farm, administrative regulations about nutrient questions mediated learning to farming across the years. The gravest problem of the Kola farmer, besides rainy weather, was how to cope with couch grass. This question was touched upon only slightly. Suppression of another perennial weed, the sow thistle, was discussed in across-the-years perspective, but not the couch grass. Neither did the discussion about soil structure cross the annual boundaries.

Why was the problem of the couch grass so ignored in the speech across the years? It may be a result of many boundaries. However, we argue that one of the main reasons is that nutrients and their leaching is constructed as such an important environmental and political question of agriculture that it may roll over other across-the-years aspects of production, such as the weeds or soil structure. In organic farming, nutrient and weed issues cannot be dealt with totally separately of each other. They are parts of a farming system that needs to be treated as a whole. According to Kaltoft (1999), the “nutrient paradigm” comes from conventional agriculture, but it is gaining importance in organic farming. In Fields 7 and 17 beset with weed problems, the decision about the following actions was heavily influenced by the crop-coverage requirement, which is part of the Agri-Environmental Scheme. According to an official responsible for organic inspection in the regional Rural Department, perennial weeds are the major problem in
organic farming (interview September 20, 2001). This study reveals the urgency to include more closely the production point of view, besides the environmental one, in organic inspections.

Hilary Tovey (1997) analyzes interviews with different actors within the organic farming movement in Ireland. In EU programs, organic farming is included as one of the options available within the Environmental Protection Schemes. According to Tovey, organic farming is most of all an alternative method of producing food, and the “environment” is considered internal to farming. It has its own vision of the relations humans should develop with both nature and society (Tovey, 1997; 33). The environmental schemes, however, consider that the environment which is in danger of being polluted by farming is something external to the food production system (ibid; 35). The analysis of the organic inspection here fits well in the framework of Tovey.

Nutrient questions are easily transformed into numbers, appropriated by the agricultural research and policy. This has not been the case with the anticipation-type of crop protection, which is important in organic weed control. Anticipatory crop protection addresses issues such as right timing and organization of work, adjustments of machines and drainage. These are much more difficult for an inspector or an advisor to interfere with than nutrient management. Moreover, agri-environmental regulation, organic included, seldom has clear rules about anticipatory crop protection. Therefore, it remains with little attention during inspections.

One explanation for the question why the couch grass problem was so overlooked in the Kola inspection could be that the inspector was not listening at the moment or she did not have advisory skills. We argue that from a developmental point of view it is more useful to consider Example 3 not as a question of individual skills but as a boundary between two societal activities: advising and inspecting. The advisory service would lead a person to listen and help the farmer. In inspection, one of the main tasks is to evaluate the fields. The inspector on the Kola farm seemed to fulfill the latter task in Example 3.

5. Conclusions
The inspection discussion touched only little with issues across the years (Table 1). Within the speech turns that refer across the years, two main topics emerged. The first is the nutrient management, which was connected with plant growth and environmental regulations. The second is the sequence of crop rotation, which appeared both as a theoretical listing, detached from the fields, and as a temporal process of the fields. The topics crossing the annual boundaries were partly linked with the “now” situation of the present growing season and show that to some extent farming across the years has been learnt. The inspection failed to bring forth the long time perspective in the control of the weed couch grass that would have been necessary on the Kola farm. The boundary in the temporal dimension was linked with other boundaries, such as how to see the fields, the form of representation of the crop sequence, and the nutrient question.

This analysis of a local and real practice of an organic inspection suggests that in order to promote balanced learning, organic inspections should be based on a broad view of the farming system. Besides environmental issues, the production point of view should be considered. The findings will contribute to the discussion about organic farming and what is important in it. They also open up the controversial relationship between inspecting and advising that should be discussed when developing these activities.
Acknowledgements
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References


IV
Spatial and Temporal Expansion of the Object as a Challenge for Reorganizing Work
Spatial and Temporal Expansion of the Object as a Challenge for Reorganizing Work

Yrjö Engeström, Anne Puonti, and Laura Seppänen

Introduction: Objects in Expansion

In theories of postmodernity, the notion of compression of time and space has become widely accepted. As Harvey (1989: 240) put it, “space appears to shrink to a ‘global village’ of telecommunications” and “time horizons shorten to the point where the present is all there is.” In his account of changes in work organizations, Sennett (1999: 22–27) continues the compression argument and declares that today’s work settings operate on the principle of “no long term.” According to Sennett (1999: 25), this “short-term capitalism” corrodes the character: “‘No long term’ means keep moving, don’t commit yourself, and don’t sacrifice.”

While there is plenty of evidence for compression in our everyday experience, authors such as May and Thrift (2001) have good reason to warn for underdeveloped analyses behind claims that only see compression and shrinkage in our spatio-temporal worlds.

To some considerable extent, this under-development is a consequence of too heavy an emphasis being placed upon developments in transport and communication technologies and not enough upon developments elsewhere both in the field of technology (or what we prefer to call the domain of instruments and devices) as well as across a number of the other domains through which the experience of TimeSpace is rendered. When these more numerous developments are considered, and the connections between each traced, the picture is less of any simple acceleration in the pace of life or experience of spatial “collapse” than of a far more complex restructuring in the nature and experience of time and space. . . . With these changes space is seen to both expand and contract, time horizons to both foreshorten but also to extend, time itself to both speed up but also slow down and even to move in different directions. (May and Thrift 2001: 10)
We agree with May and Thrift that transport and communication technologies are an insufficient basis for analysis. Beyond that, we maintain that technologies and instruments in general, separated from the objects upon which they are used, are an equally insufficient basis. We argue that a new, more interesting insight into the developmental dynamics of timing and spacing in work organizations can indeed be gained if we shift the focus of analysis onto the objects of work. We suggest that the ongoing historical transformations in objects of work are best conceptualized as expansion rather than compression.

In cultural-historical activity theory, human conduct is seen as object-oriented activity. Leont'ev (1978: 52) pointed out that the concept of object is already implicitly contained in the very concept of activity; there is no such thing as objectless activity. An object is both something given and something projected, anticipated and constructed. An entity of the outside world becomes an object of activity as it meets a human need. This meeting is “an extraordinary act” (Leont’ev 1978: 54). In this constructed, need-related capacity, the object gains motivating force that gives shape and direction to activity. The object determines the horizon of possible actions.

The subject constructs the object, “singles out those properties that prove to be essential for developing social practice,” using mediating cognitive artifacts that function as “forms of expression of cognitive norms, standards, and object-hypothesis existing outside the given individual” (Lektorsky 1984: 137). In other words, objects are constructed and invested with meaning by means of cultural tools. Such mediating tools operate not separately but in complex constellations we call instrumentalities. Emerging new objects call for and generate new instrumentalities.

Our activity-theoretical concept of object is related to Knorr-Cetina’s recent work (1997, 1999; see also Latour 1996; Rheinberger 1997; and Daston 2000 for related arguments). Knorr-Cetina (1997: 9) makes the bold claim that “objects serve as centering and integrating devices for regimes of expertise that transcend an expert’s lifetime and create the collective conventions and the moral order communitarians are concerned about.” Her contribution is a call for serious attention to objects of work as sources of new kinds of motivation and sociality. The problem in her work is its relatively weak historicity. Knorr-Cetina distinguishes between “technical objects” and “epistemic objects.” The latter are typical to scientific work and expert-like work in general. They are openended “processes and projections rather than definitive things” (Knorr-Cetina 1997: 12), implying a radical expansion of the temporal and spatial dimensions of work. But the emerging characteristics of such epistemic objects of expert work are left very vague.
Stepping into the realm of management and organization studies is helpful in opening up the historical and practical landscape of objects of work. Victor and Boynton (1998) suggest that we can examine the evolution of work in capitalism as a succession of five major types: craft, mass production, process enhancement, mass customization, and co-configuration. The last one of the five, co-configuration, is particularly interesting from the point of view of the spatio-temporal expansion of the object.

When a firm does co-configuration work, it creates a product that can learn and adapt, but it also builds an ongoing relationship between each customer-product pair and the company. Doing mass customization requires designing the product at least once for each customer. This design process requires the company to sense and respond to the individual customer’s needs. But co-configuration work takes this relationship up one level—it brings the value of an intelligent and “adapting” product. The company then continues to work with this customer-product pair to make the product more responsive to each user. In this way, the customization work becomes continuous.

... Unlike previous work, co-configuration never results in a “finished” product. Instead, a living, growing network develops between customer, product, and company. (Victor and Boynton 1998: 195)

A hallmark of co-configuration is “customer intelligence.” To achieve it, a company will have to continuously configure its products and services in interaction with the customer. Victor and Boynton (1998: 197) name medical devices and computer software systems as two leading industries where co-configuration is being implemented. They emphasize that co-configuration is more than just smart, adaptive products.

The application of configuration intelligence to the product creates a system of customer, product or service, and company. The complex of interactions among all three, as a product or service adapts and responds to the changing needs of the customer, is the underlying, dynamic source of value. ... With the organization of work under co-configuration, the customer becomes, in a sense, a real partner with the producer. (Victor and Boynton 1998: 198–199)

Victor and Boynton focus on customer-intelligent products, such as sophisticated digital hearing aids, as examples of co-configuration. It is more difficult, but equally important, to determine what kinds of services and administrative products might be “customer-intelligent” and co-configuration.
Standardized services and administrative decisions delivered on the spot do not qualify. But what about trajectories of complex investigations of economic crimes produced collaboratively by the police, the tax officials, and the prosecutors? Or multiyear crop rotation trajectories for organic vegetable farms produced collaboratively by advisors and farmers? Or long-term care trajectories of chronically ill patients produced collaboratively by primary care health centers, hospitals, and patients?

These are relatively novel objects of work. The very notion of trajectory is an attempt to interweave the temporal and the socio-spatial, as it "refers to a course of action but also embraces the interaction of multiple actors and contingencies that may be unanticipated and not entirely manageable" (Strauss 1993: 53). We claim that compared to their predecessors, the objects we just listed are expanded both spatially and temporally. In the following three case studies, we trace the objects and their expansion in economic crime investigations, in organic vegetable farming, and in the medical care of chronic patients with multiple illnesses.

The creation, mastery, and maintenance of such expanded objects is a demanding and contradictory challenge to the parties involved. Expanded objects require and generate, and are constructed by means of, novel mediating instrumentalities. In each of the three cases, we will examine the new instrumentalities as they emerge in interaction with the new objects. In each case, we will discuss only selected examples of the new instruments; an examination of their full variety and complexity is not possible within the constraints of this chapter.

**Case 1: Expansion of the Object in the Investigation of Economic Crimes**

A "traditional" crime, such as robbery or homicide, always takes place at a certain time and place. Economic crime, or white-collar crime as it is often called, is much more complex: it is often committed over an extended period of time, and nobody can point to an exact time at which the boundary between legal and illegal was crossed. Nor can an exact place for a white-collar crime be appointed: the perpetrator may have a permanent residence in one location, the company domicile may reside somewhere else, and company property may even be located in other countries (see, e.g., Geis, Meier, and Salinger 1995). In addition to the difficulties in placing this kind of a crime in time and place, it often requires a lot of work to show that there is a crime in the first place—economic crime often toys with the thin line between legal and illegal.

The investigation of economic crimes has initially followed the investiga-
Figure 7.1  A Sequential Model of White-Collar Crime Investigation

![Diagram of investigation process]

Source: Puonti, in press.

...tion lines of more traditional types of crime—local police departments investigating and asking for assistance from other police departments and agencies when needed. The traditional model of investigation may be compared to a track relay: each agency takes care of its own part of the investigation, often sequentially and passing the baton through documents without personal contact. A simplified example of a tax-crime investigation according to the traditional mass-crime model is presented in Figure 7.1.

However, it is practically impossible to investigate temporally and spatially distributed economic crimes without collaboration between agencies. Investigation may be started at one police department and then moved to another. As the crime does not obey the boundaries between different authorities either, collaboration is needed also between the police, the tax authority, the enforcement authority, and the prosecutor as the most regular partners. They have to find new ways of collaboration to fight this type of crime efficiently. A parallel model of collaboration between Finnish authorities has been promoted in efforts to control white-collar crime. In Figure 7.2, the horizontal arrows represent movement in time and the vertical arrows represent interaction between the participants.

In the ideal model, investigation starts with a stakeholder meeting in which the goals, resources, timetables, and actions are preliminarily negotiated and agreed upon. The investigation often culminates in a collaborative house search, which is the crucial tool for getting information about the criminal activity.

The parallel model of investigation increases interaction between organizations but it is also changing radically the dimensions of time and space for the participants. These dimensions have to be understood in a new way: the police officers, tax inspectors, enforcement officers, and prosecutor need to form a collaborative community that is involved in the case for the whole period of pre-trial investigation. No longer will the investigation involve each agency separately and sequentially in its turn.

A key challenge in economic crime investigation is the complexity of the crimes themselves and the multiple aspects one crime may include. No one has been able to provide a generally valid definition of white-collar crime,
and even if one could be reached, crime itself changes all the time (see, e.g., Friedrichs 1996: 5–7; Laitinen and Virta 1998: 11–14). The authorities should also stress different sides of the crime and its investigation, and they have to negotiate the priorities. Is it more important to recover the criminally gained profit or to get the perpetrator to prosecution? Is it more important to stop the criminal activity or to ensure that the creditors will get their money back? The emphasis in economic crime investigation has lately been on the restoration of criminally gained profit to stop criminal activity more efficiently. It has been claimed that the restoration of criminally gained profit could form a common goal for the authorities. In practice, the crime and its investigation must be constructed separately in each investigation process, and the goals have to be negotiated among the participants.

**Temporal Expansion of the Object in Economic Crime Investigation**

A specific feature of economic crime is its temporal fragmentation. It is difficult to say when a crime was committed; in the reports of offense the time is often marked according to accounting periods such as “between 5/1/1996 and 4/30/1997 and between 5/1/1997 and 4/30/1998.” The crime itself may consist of short-term actions spread over a long period of time, often several years. Economic crime is also carefully planned: for example, the operating periods of criminal companies are so limited that the rigidly reacting authorities would not be able to notice the crime until the company has been terminated and the operations and property moved on to the next company.

The investigation of a traditional crime normally starts after the crime is committed and a report of an offense is made. The new challenge that has come along with economic crimes is to find real-time evidence of an ongoing crime. This is necessary in order to retrieve the criminally gained property
from the perpetrator and thereby stop the criminal activity permanently. This often leads to a long period of intelligence and information gathering before the active pre-trial investigation.

The object of economic crime investigation is not a standardized item but a complex entity that is both spatially and temporally different from the object of traditional crime investigation. The investigators of so-called mass crimes are facing a situation where their main problem is the vast number of cases under investigation. They often have a workload that seems quantitatively impossible to handle.

Excerpt 1
There [in the previous work context of mass crime investigation] the volume was totally different. The number of cases may well have varied between 50 and 150. . . . You’d have 150 cases and you’d have to remember and know what and who are there [in the case], whom to interrogate, and you even should investigate a little. . . . You couldn’t just watch around for a couple of days because new stuff [cases] kept fluxing in. . . . There’s the problem that the rhythm was so tough, you had to go fast all the time, clients kept coming in and phones kept ringing, and new cases coming in, it’s exhausting.

In economic crime investigation, the number of cases per investigator is radically smaller but the quality of the cases requires a new kind of case management. The work of one of the economic crime investigators we followed was blocked because all four cases he had under investigation were awaiting for the output of another stakeholder in the case (prosecutor, tax inspector, accounting specialist). One of the cases was particularly frustrating for him because the tax inspectors had promised to give a preliminary tax inspection report in a couple of weeks and it was remarkably delayed. The tax inspectors were tied up with other work commitments and the start of the inspection was postponed several times. Each day, the police officer was expecting the reports to be finished. This waiting was nothing new to him. When asked about the future, he said laconically: “The same pattern again. We’ll be waiting for the tax authority again.”

In this case, the delay of the preliminary tax-inspection reports from the originally promised “a couple of weeks” to four months triggered a series of postponements. When the preliminary reports were finished, the police, the enforcement officer, and the tax inspectors had so many commitments due to other cases, holidays, and training courses that a mutually acceptable time for a house search could not be found in the spring, and it was postponed until the fall. In the fall, another complex crime case engaged the police officers, the tax inspectors, and the enforcement officers at the unit to the
extent that, finally, the house search was conducted more than a year later than originally planned.

The new kind of object, temporally fragmented and extended, forces the authorities to try to synchronize their activities. However, this is not easy because the object is not a standard one but different in each investigation. Synchronization problems often emerge in economic crime investigation as the rhythms of different participants need to be merged into one investigation trajectory. Successful synchronization requires an increase in the negotiations across organizations—an expansion in the socio-spatial dimension.

**Socio-Spatial Expansion of the Object in Economic Crime Investigation**

The socio-spatial expansion of the object in economic crime investigation means that any participating actor needs to see the crime not as an entity in and of itself but as *an entity continuously constructed by the multiple investigating agencies*. The fact that the agencies participating in collaborative investigation processes are normally located physically far from each other does not facilitate this shift. The authorities have tried to resolve this problem and, at the same time, span the organizational boundaries by placing tax inspectors and enforcement officers as liaisons at police departments. It is expected that sharing a place will create a space for interaction that facilitates collaboration and makes it easier to find mutually accepted ways of working and synchrony between organizations.

In one of the cases we followed, the different orientations of the police and the tax office clashed despite the fact that a tax inspector (T1) was permanently located at the police department (Puonti 2003). In the starting phase of an investigation, the police emphasized the essential elements of the crime and finding of the evidence; the tax authorities emphasized the debiting of taxes. The police also seemed to emphasize the stake of the actual perpetrator, the actual owner of the investigated companies, and address the criminal liability toward him. They did not seem to be interested in the individual employees as much as the tax inspectors, who wanted to get the unpaid taxes from individual workers as well.

In this case, interestingly, it could be seen how the tax inspector also acted as a boundary spanner between the two authorities, attempting to facilitate collaboration between them. In the meetings, he supported both the police and the tax inspectors with his comments: he seemed to jump over the organizational boundary, back and forth if necessary. In the following example the role of the tax inspector (T1) as a boundary spanner in a meeting between police officers (P) and tax inspectors (T) stands out. During the meeting, the
police explained how ideal a situation it would be if the tax authority were able to make a report of an offense to empower the pre-trial investigation. The tax inspectors were skeptical and stressed the high threshold for making an offense report. Yet, in the following excerpt, which occurred a few minutes later, the tax inspector working at the police department (T1) anticipated erroneously the statement of another tax inspector (T2).

Excerpt 2
P1 So, based on the current knowledge, if you already can suspect . . .
P Yes that would be it.
P1 . . . something about the present [companies], that would be the best situation, that's what we'd like to have an estimation about.
T2 Preferably, preferably we'd like to have such information about the new companies so that we can immediately . . .
T1 Make a report of an offense, yes, report of an offense.
T2 . . . act on them. If we start to investigate the tails [old companies], well then, the further [back] we go, the harder it is to inspect [new] activities that are shifted elsewhere.

Here T1 seemed to try to support T2, but anticipated his thoughts erroneously. The anticipatory comment turned out to be an utterance that supported the police, not the tax inspector.

Often the attempts of boundary spanners remain individual, isolated attempts. It is difficult to actually span the boundary without tools that are more effective than mere speech. The obscurity and complexity of economic crime may require exceptionally efficient tools: common discursive tools such as those used in the meeting described above may work in other situations, but in this case they led to the formation of a splintered object of work. The police and the tax inspectors are in fact "the makers" of the crime during the investigation process. In a way, they become integral parts of the object they construct. To grasp this, they need a repertoire of self-reflective and dialogical instruments.

_Toward a New Instrumentality of Economic Crime Investigation_

When the object of work, the crime itself, is obscure and messy, it is often necessary to construct a representation of the object that one can concretely point to. The investigation process is also embodied in a vast influx of information, mainly paperwork. Compressing information in an easily conceivable form is a means of managing the information. One commonly used tool among the investigators is to turn the information into graphic form.
A graphic depiction used in white-collar crime investigation (Figure 7.3) translates thinking into a tangible artifact, a map, that is basically a manifestation of the socio-spatial relations within the object of work. Such a map serves to enhance communication and guide it toward relevant relations instead of irrelevant details.

Graphic depictions such as Figure 7.3 are normally drafted by an assistant and distributed to all participants. In this respect, they are different from many other kinds of models that are jointly constructed by the investigators or researchers themselves (Lynch 1985). However, their construction and use are not standardized.

A graphic depiction was used in two out of the three cases we followed. In the first case, the main investigator told the interviewer that the case was so simple that no depictions were needed. In the second case, a depiction was produced by the tax office. Despite this, it was criticized by the tax inspectors for being unfinished and sketchy. It had practically no relevance in the investigation process. It was distributed to the participants but no shared use was observed.

In the third case, several types and versions of graphic representations were used to depict the case, the most important ones being charts showing the flow of money between companies and a time line of the life span of the numerous companies under investigation. These were included in the house search plan that was distributed to all participants and used in a variety of ways by them. In the interviews made after the house search, some stated that these graphic figures had been very important in finding out what the case was about, while others said that they already knew everything that was in them and that they did not need those depictions anymore.

The parallel model of economic crime investigation (recall Figure 7.2 above) is also a shift toward a project-like model of work. Planning the investigation is often a long, time-consuming phase that is not materialized in a clear form. The police officers we interviewed talked a lot about an investigation plan, but none of them was able to show one on paper. When asked about the investigation plan, some of the investigators showed us a plan ("notes" or "coordinates") made for the house search. Others told us that the plan was in their head, not on paper. No shared investigation plan was documented in the three cases followed. However, in all three cases, a partial plan (a house search plan) was made and distributed to all participating before the house search.

What makes planning in white-collar crime investigation difficult is that the crime is typically obscure, information is hard to gain, and new information may change the plans suddenly several times during the investigation. Thus, the plan should be flexible and enable quick changes.
Figure 7.3  A 3-sized Graphic Depiction of a Network of Companies Suspected of White-Collar Crime

Note: The figure illustrates the flow of money between the companies under suspicion. It was used in an actual economic crime case (names are blackened by the researcher for confidentiality).
The need for a more encompassing investigation plan and documentation of the decisions made was recognized in one of the cases followed. There was a misunderstanding between the tax inspectors and the police officers about the timing of the specifications to the tax inspection report. This frustrated the police. After acknowledging the different views of the police and the tax inspectors concerning the tax-inspection report, the police officer in charge formulated the task as follows.

**Excerpt 3**

[I]n the future, in the projects I lead, we’ll keep a record of all the meetings between the authorities that are held in connection with an actual case, and all the participants will get a copy. That’s how we’ll make sure that everybody involved in the project knows what each and every person is committed to.

Finally, members of the unit designed a whole new tool, a Project Plan. The Project Plan (Table 7.1) is a document that includes information on the general background of the case, goals, schedules, methods, division of labor, resources and risk analysis, and how the exchange of information is to be handled between the participants, the clients, and the media. One purpose of the plan was to facilitate collaboration between the authorities. Subsequently, the Project Plan was tested in real cases.

The Project Plan is a tool designed and used by practitioners in order to make visible and manage the temporal movement of the object. The project plan and the map of the object (such as that shown in Figure 7.3) are together a rudimentary new instrumentality for mastering the expanded object of economic crime investigation. What is interesting in this case is that both of these tools were constructed from the bottom up by practitioners involved in specific cases. In this case, the new representational tools were not so much drivers of change and groundbreakers for a new object. They were local adaptations to an object that had already expanded beyond the customary skills, tools, and interaction patterns of the practitioners.

**Case 2: Mastering Crop Rotation in Organic Vegetable Farming**

Environmental issues have increased public concern and support for alternative and sustainable agriculture, among which organic farming is an established and growing sector. The market expansion also favors organic agriculture in Europe and worldwide. However, learning organic farming is not easy. Many of the natural processes farmers are facing take longer to
Table 7.1

Project Plan Template Designed by a Police Unit

General information
  Background of the case

Planning
  Primary goals (e.g., business prohibition, getting the cases revealed during the investigation to be investigated, etc.)

Coordination
  Schedule (starting the operations, proceeding, etc.)
  Methods (intelligence methods, coercive means, tax inspections, etc.)
  Division of labor between authorities/resources available (main investigators, inspectors, enforcement, officers in charge, who is doing what, who is involved in each phase, etc.)

Risk analysis
  What can go wrong, how to avoid failures (taking the changing operational environment into account, failure of coordination, reaching people, making backups)

Flow of information
  Exchange of information between authorities (contact persons, reachability)
  Contacts between authorities and suspects
  Contacts to the media (officer in charge responsible for the release of information, but communications are negotiated in order to gain best possible effect and right timing)
  Feedback occasion (trying to learn collaboratively by reflecting on the experiences at the time of finishing the case)

Note: Translated into English by the authors.

dead with than the one-year production cycle, which is important in terms of marketing and economics. Organic nutrient mineralization, plant diseases, soil structure, and perennial weeds are examples of these natural processes. In organic farming, where synthetic pesticides and industrialized fertilizers are not used, a long-term time perspective is needed for production management. The concept of sustainability, often present in actual debates on the use of natural resources, implicitly contains the time dimension.

The object of an activity is historically formed and situationally reconstructed. To understand the changing object of organic vegetable farming, two historical dimensions are helpful, namely (1) “entrepreneurship and customer-orientedness,” and (2) “sustainability in resource use” (Seppänen 2000). With the help of these two dimensions, four types of objects in organic farming may be identified (Figure 7.4).
The ambiguous object is represented by farmers oriented neither toward sustainable use of natural resources nor toward customers. The time dimension in their planning is short, consisting mainly of the one-year productional cycle.

2. The resource object is represented by farmers mainly concerned about the maintenance and improvement of natural resources, such as soil fertility. Crop rotation is considered as an essential element in this. A prolonged time perspective, important in planning and implementing crop rotation, corresponds to the old peasant time conception that spans over generations. The linkage of production to the market does not play an important role.

3. The marketing object is represented by farmers who emphasize economics and entrepreneurship. Customers and products are of importance to these farmers. The time perspective is short. Ecological uses of resources, such as crop rotation, are seen as rules that limit marketing possibilities. In broad terms, the starting point of the Kola organic vegetable farm examined in the following account represents this type of object construction.

4. The integrated object is represented by farmers for whom the sustainability of resource use is not at odds with, but an integral part
of, marketing the products. Crop rotation brings continuity to production and quality to the products. The time perspective is long, allowing simultaneously quick actions in the short run. Here, the concept "organic" is of central importance, referring to the constitution of an organized whole between natural resources, farming, and consumers.

Temporal Expansion of the Object in Organic Farming

The temporal dimension in specialized agriculture varies according to type of production. Production of milk or beef, or perennial crops, proceeds in long cycles of various years, while chicken production and some forms of greenhouse growing have many production cycles per year. In arable farming, such as that of cereals or vegetables, a common productional unit is a growing season, starting in the spring with the sowing time and ending in the fall with harvesting and gaining the income from the yield. The necessary time perspective in organic farming was expressed by an advisor as follows.

Excerpt 4

An organic farmer must always look ahead over at least one year when choosing, for instance, crops for the next growing season, while in the conventional production, solutions can be made for one growing season only.

The key question for the farmer is: "What and how shall I (as a farmer) cultivate this year, so that I can succeed in farming in the coming years as well?" Part of the economic benefit that accumulates this year will be realized in later cash crop production years.

The following case data were collected at an organic vegetable farm, Kola, which earlier produced flowering annuals in greenhouses in a market- and business-oriented manner. While these features are also needed in the new activity of organic vegetable farming, the two forms of production differ in their temporal cyclicity and control of production. In the greenhouses, the Kolas had had three production seasons per year. The greenhouse plants were sown or planted and grown according to ready-made standardized procedures in the well-regulated conditions of the greenhouse. After selling the flowers, the greenhouse tables were cleaned, waiting empty until the next production season started again.

The new activity of the Kolas, organic vegetable farming, is different. The cultivation techniques are not standardized because it is a new type of production and because organic farming techniques vary according to the local conditions of field and farm. The farm fields do not wait empty; they have a complex
life of their own that has to be anticipated. Therefore, organic vegetable production requires a time perspective covering many years and production seasons. And despite the anticipation, risks remain. Besides a long time perspective, improvisation and quick action are needed as well. The temporal expansion in organic farming is not only a linear extension of time: it also includes changes in short-term farming. The time dimension acquires a new quality.

The instrument that mediates the time dimension of organic farming is *crop rotation*. It is one of the major strategies in sustainable agriculture and organic farming (Altieri and Rosset 1996: 11). In planning the crop rotation, a sequence of crops is formed that would benefit the yields and sustain the farming system. A successful crop rotation plan makes all the elements of the farming activity fit together. In crop rotation, the time dimension is combined with the localization of the fields through the activity of the farmers.

On organic farms without animal husbandry, crop rotations often include *green manures*. This means that nitrogen-fixing legumes, such as clover of vetch, are sown together with grasses for fertilization and soil improvement purposes. Green manures do not produce income in the year they are sown. Staying in the temporal frame of one year, spending land and resources for green manures does not make sense. The use of green manures becomes understandable only in the longer perspective, where growing them is turned into financial benefit during the next or later years. The long-term challenge is therefore present in fields with green manures. Green manures change the annual time perspective as well. Organic vegetable farmers have to allocate their time, taking care not only of changing conditions of vegetable fields but also of those of green manures in their everyday practice.

Crop rotation also has an institutional and administrative meaning. Having at least a five-year crop rotation plan, accepted by experts, is a precondition for passing inspection as an organic producer. All organic farms are inspected once a year during the growing season.

*Toward a New Instrumentality in Organic Farming*

For five years, the Kola enterprise produced both greenhouse flowers and organic vegetables. Greenhouse production was finished in 1997. The trajectory under analysis in this chapter, in 1998, was the first production season to depend economically on only organic vegetable farming. The Kolas wanted to cultivate larger acreages with vegetables than before, and therefore they needed a new crop rotation. This was constructed together with an advisor and one of the researchers in March 1998.

In the planning of the crop rotation, the advisor first mapped the state of the art of the Kola farming activity by asking questions about the machinery,
Table 7.2

**Crop Sequence as a Representation of a Crop Rotation**

1. Green manure
2. Green manure
3. Vegetables
4. Root vegetables
5. Green manure
6. Vegetables

hired labor, yield levels, income, and so forth. Then a new crop sequence was designed. The advisor argued for the benefits of perennial green manures, while the farmers preferred annual green manures and a larger acreage with vegetables. The outcome, a six-year crop rotation, was a compromise between these views (Table 7.2).

After this, the field plots were divided into six ‘rotational turns’ that corresponded to a six-year rotation sequence. This was meant to balance out, in the course of the years, the ratio between vegetables and green manure. A map of the fields was an important spatial tool in doing this (Figure 7.5).

After the rotational turns were done, the advisor entered the field plots and their acreages into an Excel spreadsheet, specifically designed by advisors in organic farming. The crops of the coming season of 1998 were planned in rough outline. Taking into consideration the history of each field, the rotation sequence was placed rather mechanically on each turn. The outcome of the planning meeting was a table that included all the field plots and their crops for the following five years (Table 7.3).

Unfortunately, the growing season of 1998 was extremely bad, with too much rain. The Kolas had to work hard and got very tired. In the beginning of August during an organic inspection, the farmer walked through all the fields together with the inspector. Table 7.4, first column on the left, shows the route of the organic inspection. At the same time, it shows how the crop rotation, planned in March, was implemented in the fields.

To master the expanding object of organic farming, it is crucial that the farmers construct and conceptualize their crop rotation by crossing the borders of annual production seasons, either to the previous season or to the following year(s) (Seppänen and Koskimies 2002). We may call this “farming across the years.” The inspection discussion is not particularly good for showing the situated improvisation aspect of the time dimension of everyday farming practice. But it shows quite well to what extent and how the time perspective that extends beyond one year is put into words and dealt with (Table 7.4). The speech across the years, present in the inspection discussion, is part of the instrumentality in expanding the object.
In Table 7.4, columns B to D show the numbers of turns of talk where farming across the years appears. Column A represents speech about that particular growing season. For our analysis, the shaded columns B and C are most important as they represent turns of talk that deal with the management of the fields.

Column B represents those parts of the data where the boundary between years was crossed, but what happened in the past or will happen in the future was not linked with the ongoing growing season. A very common topic in
Table 7.3

Outcome of the Planning Simplified

<table>
<thead>
<tr>
<th>Rotation turns</th>
<th>1997</th>
<th>1998</th>
<th>1999</th>
<th>2000</th>
<th>2001</th>
<th>2002</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Perennial green manure</td>
<td>Vegetables</td>
<td>Root vegetables</td>
<td>Annual green manure</td>
<td>Vegetables</td>
<td>Perennial green manure</td>
</tr>
<tr>
<td>2</td>
<td>Root vegetables</td>
<td>Annual green manure</td>
<td>Vegetables</td>
<td>Perennial green manure</td>
<td>Perennial green manure</td>
<td>Vegetables</td>
</tr>
<tr>
<td>3</td>
<td>Perennial green manure</td>
<td>Perennial green manure</td>
<td>Vegetables</td>
<td>Root vegetables</td>
<td>Annual green manure</td>
<td>Vegetables</td>
</tr>
<tr>
<td>4</td>
<td>Vegetables/green manure</td>
<td>Vegetables</td>
<td>Perennial green manure</td>
<td>Perennial green manure</td>
<td>Vegetables</td>
<td>Root vegetables</td>
</tr>
<tr>
<td>5</td>
<td>Vegetables/green manure</td>
<td>Vegetables</td>
<td>Annual green manure</td>
<td>Vegetables</td>
<td>Perennial green manure</td>
<td>Perennial green manure</td>
</tr>
<tr>
<td>6</td>
<td>Vegetables</td>
<td>Perennial green manure</td>
<td>Perennial green manure</td>
<td>Vegetables</td>
<td>Annual green manure</td>
<td>Vegetables</td>
</tr>
</tbody>
</table>

*Note: Crop rotation for the next five years for the fields of the Kola farm (the rented fields are in white, the farmers' own fields in gray boxes).*
### Table 7.4

**Turns of Talk in the Organic Inspection Discussion on the Kola Farm, 1998**

<table>
<thead>
<tr>
<th>Place</th>
<th>Now</th>
<th>Speech across the years</th>
</tr>
</thead>
<tbody>
<tr>
<td>A. Ongoing 1998</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1. Home</td>
<td>45</td>
<td>103</td>
</tr>
<tr>
<td>2. On the way to the field</td>
<td>174</td>
<td>11</td>
</tr>
<tr>
<td>3. Carrot</td>
<td>99</td>
<td>11</td>
</tr>
<tr>
<td>4. Carrot and red beet</td>
<td>103</td>
<td>30</td>
</tr>
<tr>
<td>5. Onion</td>
<td>132</td>
<td>2</td>
</tr>
<tr>
<td>6. Various</td>
<td>142</td>
<td>11</td>
</tr>
<tr>
<td>7. Red clover and ryegrass</td>
<td>145</td>
<td>14</td>
</tr>
<tr>
<td>8. Berries</td>
<td>171</td>
<td>15</td>
</tr>
<tr>
<td>9. Potato</td>
<td>286</td>
<td></td>
</tr>
<tr>
<td>10. Storage and packing hall</td>
<td>85</td>
<td>2</td>
</tr>
<tr>
<td>11. On the way to hired fields</td>
<td>66</td>
<td>9</td>
</tr>
<tr>
<td>12. Potato and swede</td>
<td>51</td>
<td>4</td>
</tr>
<tr>
<td>13. Vetch and ryegrass</td>
<td>44</td>
<td>2</td>
</tr>
<tr>
<td>14. Carrot</td>
<td>66</td>
<td>4</td>
</tr>
<tr>
<td>15. Leek and potato</td>
<td>90</td>
<td>13</td>
</tr>
<tr>
<td>16. On the way to next field</td>
<td>40</td>
<td>11</td>
</tr>
<tr>
<td>17. Fallow</td>
<td>35</td>
<td>11</td>
</tr>
<tr>
<td>18. Red clover and timothy</td>
<td>217</td>
<td>3</td>
</tr>
<tr>
<td>19. On the way home</td>
<td>1,358</td>
<td>14</td>
</tr>
<tr>
<td>20. Home</td>
<td></td>
<td>45</td>
</tr>
<tr>
<td>Altogether 3,687 turns</td>
<td>3,525</td>
<td>85</td>
</tr>
<tr>
<td></td>
<td>95.6%</td>
<td>2.3%</td>
</tr>
<tr>
<td></td>
<td>85 turns</td>
<td>72</td>
</tr>
<tr>
<td></td>
<td>1.9%</td>
<td>2.3%</td>
</tr>
</tbody>
</table>

this category was the preceding crop, either asked about by the inspector ("What was growing in this field last year?") or told about by the farmer. Often this was followed by the farmer’s stating how the preceding crop grew or by a discussion of the fertilizing aspect of the crop.

Column C represents those pieces of data where the speech across years was indeed connected to the “now” situation of the growing season. Both the inspector and the farmer expressed these linkages, showing that farming across the years was actually being constructed, at least to some extent.

The nutrient questions especially were dealt with across the years. The nutrients were connected to plant growth and environmental administrative regulations. However, in other production issues, such as the weed couch grass, repeatedly addressed by the farmer, the annual boundaries were not crossed at all. It seems that the nutrients and their leaching were constructed as an important environmental and political question that rolled over other aspects of production, such as the weeds. Another topic across the years was
the crop sequence (recall Table 7.2), which appeared both as a list, detached from the fields, and as a temporal narrative about specific fields.

The need for a new Kola crop rotation plan made the Kolas contact an advisor from the local rural advisory center. Our data on the interactions between the farmers and the advisor clearly show that a crop rotation plan was not dictated either by the farmers or by the advisor. The new crop rotation plan was, most of all, the result of a common construction process between the farmers, an advisor, and the researcher.

After having checked the crop rotation plan, the advisor sent it back to the farmers and asked whether they wanted to change something in it. The Kolas did not want to change anything. So, in May 1998, the advisor sent the plan to the regional Rural Department office. All changes in crop rotation plans had to be submitted to Rural Departments within regional Employment and Economic Development Centers. The role of the Rural Department was to confirm all changes made to crop rotation plans (Heinonen and Kieksi 1998).

Organic farming, in 1998, was entitled to special aid within the Finnish agri-environmental scheme. Therefore, it was bound to other regulations, especially to the agri-environmental scheme and to other subsidy programs as well. By the end of May, farmers were to fulfill an annual production plan in order to obtain either EU-level or national subsidies. The annual production plan included what crops were cultivated on each field plot, and what type of subsidy was applied for with regard to each field. According to the inspector of the Kola farm, production plans were to match to the long-term rotation plans. This was important from the point of view of subsidies. In May 1998, the Kolas made their annual production plan in accordance to the new crop rotation.

During the Kola inspection, the inspection documents were filled at home. First, the inspector wrote on document forms the actual crops in 1998 of each field plot. Later, she filled in the question on the inspection documents about the crop rotation (Table 7.2).

In September 1998, the inspection documents were presented at a meeting of an 'organic board.' Besides the Rural Department as a coordinator, the board consisted of representatives of farmers, advisors, the Union for Organic Farming, consumers’ association, the provincial state office (food control officer), and trade. Also, fourteen organic inspectors were present at the meeting. The Kolas needed the approval of the organic board to be able to sell their products with the organic label. The inspection document of the Kola farm did not have any notes on defects, and it was accepted without discussion.

The regulation in each of the subsidy programs, such as Common Agricultural Policy, agri-environmental scheme, and so on, are based on their
own logic. In practice, farmers have to coordinate all these different regulations in their farming activity. Because of the rainy summer in 1998, the Kolas also had to find out the rules for the compensation of crop failure. For the Kolas all this meant many open questions and uncertainty about what they were allowed to do in their fields. In the spring, the Kolas participated in an educational event organized by administrators for farmers about the subsidy schemes. In addition, many phone calls had to be made to local and regional agricultural offices during spring and summer. And despite all this, uncertainty remained about what was allowed or forbidden. An excerpt from the field notes clarifies this. The researcher had just returned from fields 13 and 14, and Maria Kola asked how they looked.

Excerpt 5
Researcher: I would mow the dense couch grass in the northern part of field 14, in order to avoid seeding of the weeds and to weaken the couch grass at least a bit.
Kai Kola: You could mow it with a field chopper, but do you need some sort of permission for that?
Maria Kola: I do not want any inspector to stand here for the whole day, I don’t agree with applying any permissions.
Researcher: I don’t know about permissions, I know what would be wise to do. . . .
(Field note, July 30, 1998)

Excerpt 5 shows how uncertainty about administrative regulations prevented the Kolas from quickly acting according to the necessity in the field. In October 1998, there was another discussion about the couch grass problem, and about how to continue farming next year.

Excerpt 6
Maria: We have been thinking, then, we did sow the clover grass to [field 18], but the rotations will all be confused. We cannot follow them. After last summer. We have to get a permission for that. And most probably we will. . . .

Excerpt 6 demonstrates how Maria had started to see permission as means toward mastering crop rotation. Applying for permission was no longer something to be avoided at any cost. To the contrary, there was confidence in one’s ability to use it: “And most probably we will.” The crop rotation plan as a formal requirement forced the farmers to expand their object in terms of the social space of advisory and administrative agencies, rules, and subsidies.
Looking back at the four types of object construction depicted in Figure
7.4, we perhaps somewhat idealistically assumed that within the integrated object, "the concept ‘organic’ refers to the constitution of an organized whole between natural resources, farming, and consumers.” In light of the analysis we just presented, it seems appropriate to say that on the road toward the integrated object, advisory and administrative agencies, rules, and subsidies will be woven into the farmers’ construction of their object. At the same time, the bureaucracy around crop rotation plans may also become an obstacle to the farmers’ learning to rely on their own experiences and flexibly replanning their own land use.

The instrumentality of crop rotation planning tools was not constructed by the practitioners; it was largely given from above, partly even as a formal administrative requirement. But the templates were turned into active tools in negotiations between the farmers, the advisor, and the researcher. In this sense, the representational tools played a quite decisive role in pulling the farmers into the unfamiliar terrain of temporal and socio-spatial expansion.

Case 3: Expansion of the Object in Medical Care for Chronic Patients with Multiple Illnesses

In 1999 in the city of Helsinki in Finland, 3.3 percent of medical patients used 49.3 percent of the city’s annual health care expenditure and 15.5 percent of patients used 78.2 percent of the expenditure. The latter figure corresponds to the well-known 20/80 rule of thumb in health care—meaning that approximately 20 percent of the patients use approximately 80 percent of the resources (Helsingin terveydenhuollon kuntaprofiili 2001: 37).

Many of those who use a large portion of resources are chronic patients with multiple illnesses. Their care is difficult to plan and keep under control, both for themselves and for their caregivers. They embody the fact that objects of medical work have changed dramatically after the Second World War. As infectious and parasitic diseases have increasingly come under control, the prevalence of chronic illnesses has increased. Chronic illnesses include cancers, cardiovascular illnesses, renal diseases, respiratory diseases, diabetes, arthritis, and severe allergies, among others. These illnesses require what Wiener, Fagerhaugh, Strauss, and Suczek (1984: 14) call “halfway technologies,” that is, medical interventions applied after the fact in an attempt to compensate for the incapacitating effects of disease whose course one is unable to do much about.

That these illnesses cannot be “cured” but must be “managed” makes them different in many respects from acute illnesses, the model around which health care was traditionally built. A brief look at the salient qualities of
chronic illness makes the differences apparent. Chronic illnesses are uncertain: their phases are unpredictable as to intensity, duration, and degree of incapacity. Chronic illnesses are episodic: acute flare-ups are followed by remissions, in many ways restricting a "normal" life. Chronic illnesses require large palliative efforts: symptomatic relief (from pain, dizziness, nausea, etc.) is often as necessary as the overall progress of treatment. Chronic illnesses are often multiple: long-term breakdown of one organ or physical system leads to involvement of others. One fact becomes obvious: halfway technologies are not only prolonging life but are stretching out the illness trajectories. By trajectories we mean not just the physical course of illness but all the work that patients, staff, and kin do to deal with the illness, and all the social/psychological consequences that encircle the illness course. . . ." (Wiener, Fagerhaugh, Strauss, and Suczek 1984: 14–15)

One of the consequences is that patients move constantly between home and various caregivers.

They cycle through the hospital, then go to the clinic or doctor’s office, return home, go back to the hospital during acute episodes, and again back to their homes. The problems of coordinating the care given in the hospital, clinic, and home become immense. (Wiener, Fagerhaugh, Strauss, and Suczek 1984: 15)

The authors conclude that the inability to cope with chronic illness stems largely from the “standard categorical-disease perspective” dominant in industrialized countries. This perspective directs public attention and allocation of funds to the fight against specific illnesses, such as heart disease, cancer, or HIV/AIDS. But it also feeds competition and fragmentation among health specialists and specialties, and diverts attention away from the organization of collaborative care around actual human beings typically suffering not just from a single, well-bounded disease but from a complex bundle of illnesses and symptoms (Wiener, Fagerhaugh, Strauss, and Suczek 1984: 35)

A chronically ill patient typically becomes an object for a number of physicians, each viewing the patient from the perspective of his or her own specialty. Each specialty tends to assert the primacy of its own interest, and to lose its interest when the main responsibility is assigned to another specialty.

Primary-care physicians . . . become the mediators between specialists. Since they are less specialized than the consultants, they are not likely to be able to assert their interest in the patient as a totality. Nor are they able to defend the interests of the patient in the face of more knowledgeable and prestigious specialists.
This phenomenon within medicine is likely to result in what physicians call “Ping-Ponging” the patient. The patient is the Ping-Pong ball, and the players may be a group of specialists who bounce a patient from one to the other. They may hope that a satisfactory diagnosis will emerge that transcends the individual specialties of the collected assemblage of individuals and specialists. The injunction of colleagueship may result in all other consultants allowing one to “test” his diagnosis before the others, who will have their turn in due course. In the meantime, the effect of continuous tests, diagnostic procedures, and examinations may be as painful and as life threatening as the disease itself. (Bensman and Lilienfeld 1991: 219)

The multiple nature of chronic illness further complicates the issue.

The plurality of specialists are all likely to be attracted to the symptom or condition that takes on a primacy because of their own specialty. And so multiple and often conflicting treatments are prescribed. The drugs used may also counteract one another, or produce negative synergistic effects. (Bensman and Lilienfeld 1991: 220)

The following analysis is based on an ongoing longitudinal intervention study aimed at constructing a collaborative and negotiated practices of care between primary care and specialized hospital care in the city of Helsinki (see Engeström, Engeström, and Vähäaho 1999; Engeström, in press; Kerosuo 2001).

**Temporal Expansion of the Object in the Care of Chronic Patients with Multiple Illnesses**

The traditional object of medical work, as it is practically defined and bounded both in hospitals and in primary care, is the patient visit or “care episode.” In other words, the object is temporally and socio-spatially bounded to a single continuous episode or encounter of physical presence of the patient. Administratively, such a unit has been reasonably easy to standardize. With the increasing prominence of multiple chronic illness requiring long-term continuity of care, however, this unit is breaking down.

In our project in Helsinki, we conduct so-called laboratory sessions with practitioners from both primary care and specialized hospital care, each session centered on a particular chronic patient who is also present in the session. For each session, one of the physicians engaged in the care of the patient prepares a preliminary analysis of the problems and possible solutions in the joint management of the patient’s care, to be presented at the laboratory
session. For such analyses, the physician is asked to discuss with the patient and with other caregivers possible gaps and miscoordinations of care, using past patient records as reference. The expansion of the temporal dimension of the object regularly comes up.

For the first laboratory session in 2001, a chief physician of rheumatology at the university hospital prepared the analysis of a patient case. At the session, the physician reported on the analysis.

Excerpt 7
Laboratory session #1, 2001
Chief rheumatologist: When we discussed with Lisa [the primary care general practitioner responsible for the patient] there at the primary care health center, then—and it shows of course in the patient records, it does not say that medication has been changed, the dosage of M [name of medication] has been increased, no information about that has been sent to the health center. And one can think that of course it should be sent. But no, that is not done. And probably nobody among us there is completely free of this sin. That for me is perhaps the biggest issue. Because this has been repeated many times over the years, that medication has actually been changed or something like that, which without question, when I now begin to look at it, plain common sense says that a copy of the patient record should in this case be sent to the patient’s primary care personal physician. But it has not been sent, and a number of these occurrences have accumulated.

The crucial point in excerpt 7 is the expression “Because this has been repeated many times over the years, that medication has actually been changed or something like that. . . “ The preparation of the analysis for the laboratory session forced the physician to expand the time perspective on the patient’s care trajectory and led to a critical revelation. Here the time perspective expanded into the past. A little later in the laboratory session, an expansion into the future was expressed.

Excerpt 8
Laboratory session #1, 2001
Primary care administrator physician: Even though I am a representative of primary care, I still think that specialized hospital care really doesn’t necessarily have to do all these things over such a long duration, particularly because the Helsinki health centers do have their own outpatient clinics and systems both for the distribution of aid equipment and with regard to rehabilitation.

The administrator physician was expressing her worry about patients becoming tied to specialized hospital care for long periods, without any end in
sight. Her point was that the specialized care “doesn’t necessarily have to do all these things over such a long duration,” implying that specialized care should involve primary care in long-term care plans for chronic patients such as the one discussed in the session.

Socio-Spatial Expansion of the Object in the Care of Chronic Patients with Multiple Illnesses

The patient visit or care episode as a traditional way of bounding the object of medical care compresses the patient and the illness into the spatially closed box of what happens and is observed inside the walls of the doctor’s office or the clinic. As chronic patients increasingly drift between multiple caregiver locations, the closed notion of the object breaks down.

This is regularly witnessed as the physician conducts the analysis of a patient case. To understand the patient’s care, the physician has to seek out the different caregivers who contribute to the care trajectory. The chief rheumatology physician discussed above realized that he had to seek out and meet the patient’s primary care general practitioner if he wanted to understand the whole picture of the patient’s care. Thus, he took the highly unusual step of physically transporting himself from his hospital clinic to the primary care health center to visit the general practitioner. A member of our research group interviewed the two physicians on the spot immediately after their meeting.

Excerpt 9
Interview at the health center in preparation for laboratory session #1, 2001
Researcher: Well, what did you have in mind primarily, what did you want to clarify here?
Chief rheumatologist: Specifically this patient’s care relationship with the health center, about which I don’t know very much. There are illnesses here for which the patient has been entirely in the care of the health center, and there are mentionings about them in there [in the patient records]. And we went through them, and we concluded that at least from my point of view it feels good, that this is the way it should be. Then we pondered this, which was already taken up in my meeting with the patient, this back injury and its care. And we decided that we will work it out, through here, and we will interview the patient in a bit more structured way. So we’ll look into what it is all about.

The physician’s point about back injury refers to a recent accident in which the patient fell and broke a vertebra. The injury was treated in a hospital emergency room but to the doctor’s dismay, the patient was quickly released,
sent home, and directed to the rheumatology clinic for the continuation of care—without consulting with the rheumatologists. The identification and negotiated mending of such ruptures between spatially distributed caregivers is a central part of the socio-spatial expansion of the object in this case.

Toward a New Instrumentality in the Care of Chronic Patients with Multiple Illnesses

In the course of the laboratory meetings, the participating practitioners and our research group together designed new instruments aimed at facilitating the collaborative representation and negotiation of the patient’s trajectory of care. The idea is that the new instruments are used jointly by the patient and the key caregivers.

To represent the most important caregiver connections of the patient, we constructed a one-page document called the care map. Figure 7.6 is a reproduction (translated into English) of the care map constructed by the chief rheumatologist in collaboration with the patient and the primary care general practitioner of the case discussed above. Figure 7.7 is a version of the same representation, constructed by the rheumatologist to point out the three crucial ruptures he had found in the coordination of the patient’s care between the different caregivers.

At the laboratory session, the chief rheumatologist explained the third rupture in Figure 7.7 as follows.

Excerpt 10
Laboratory session #1, 2001
Chief rheumatologist: Point three is such, like we heard on the video clip, this was the most inappropriate event. And as I understood it, this event happened such that as the vertebra was broken and a hard back pain ensued, and you [referring to the patient] were at the city emergency hospital, and they took the attitude that since there is nothing that can be surgically treated, they gave you a prescription for pain killers and told you that it’ll probably heal by resting at home. But the pains were severe, and the patient could not manage at home. There was no home help service, and she had to come again. And then she was moved to the city’s primary-level hospital and stayed there for some time for treatment. And I got such a strong feeling here that, as we continued to discuss this, and half a year had passed, that one could still clearly see that this matter caused a lot of anger. This was, if we think what does not work, this was the topmost issue from the recent years. I succeeded in meeting the surgeon who saw her [at the city emergency hospital]. But then the physician had changed in the middle of the care, which happens in emergency medicine, and another physician
was in charge of her til the end. And I was not able to meet this second physician, not even talk to him/her. And then those medical records did not in any way reveal [this], they gave the impression that everything went as it was supposed to.

Excerpt 10 demonstrates how a dialogical, negotiated construction of communicative representations of the patient’s care led to the identification of serious gaps in the socio-spatial network of care (the patient characterized such a gap as “being in a void”). It also led to the temporally expansive realization that experiences of such gaps can have long-term effects: “and half a year had passed, that one could still clearly see that this matter caused a lot of anger.” Finally, it led to the critical realization that existing official documentation of care can completely ignore such problems: “those medical records did not in any way reveal [this], they gave the impression that everything went as it was supposed to.”

Along with the care maps shown in Figures 7.6 and 7.7, the practitioners found care calendars to be very useful instruments for dealing with the expanding object of their work. The care calendar basically lists in temporal order all the important past and current events and contacts in the patient’s care trajectory. The events are listed in a condensed form, typically on one or two pages. But the condensed form is constructed and updated jointly by the patient and the physicians, aiming at a capturing not only events deemed significant from the official point of view but also those considered significant by the patient. An example of a care calendar, again produced by the
chief rheumatologist together with the patient and the general practitioner, is depicted in Table 7.5.

Neither the care map nor the care calendar was particularly complete or accurate in the form in which they were first presented by the chief rheumatologist at the laboratory session. Their point was to facilitate joint examination, remembering, interpretation, and revision, not to present some sort of an authorized true depiction of reality.

The instruments depicted in Figures 7.6 and 7.7 and Table 7.5 are not in themselves dramatically original or powerful representations. What is novel about them is that they were produced and meant to be used by all the key parties involved in the patient’s care, including the patient herself. Thus, they became vehicles of critical reflection and joint planning.

In this case, the basic templates for the instruments were worked out by researchers and practitioners over a series of intervention sessions. As the templates were put into use and filled with content by practitioners, they were themselves molded and reconfigured to fit the particular case and circumstances. The practitioners test and twist these instruments as potential groundbreakers and spearheads toward grasping the temporally and spatially expanded object of care trajectory.

Conclusions

At the beginning of this chapter, we challenged the prevalent notion of the overwhelming compression of time and space in postmodernity, or new capitalism. Our claim is that compression appears as the sole dominant tendency
only when one fails to examine carefully what is happening in and around the objects of work. In Table 7.6, we summarize our findings concerning the transformation of the object in the three cases examined above.

When we talk about the object, we need to distinguish between the generalized object of the historically evolving activity system (compare G.H. Mead’s [1934] “generalized other”) and the specific object as it appears to a particular subject, at a given moment, in a given action. The particular crime facing the police investigator, the particular fields and crops facing the farmers, the particular patient facing the physician here and now do not neatly fall into either the generalized category of the “old object” or that of the “new object” as defined in Table 7.6. The particular, situationally constructed objects are unstable mixtures and partial manifestations of the generalized objects.

Objects do not appear, take shape, and become stabilized without instrumentalities. It is curious that in much of the recent work on objects (e.g., Knorr-Cetina 1997) there is very little talk about instruments. Correspondingly, recent work on the evolution of cognitive instrumentalities (e.g., Renfrew and Scarre 1998) tends to omit the objects on which instruments are used and which give rise to the instruments in the first place.

The notion of expansion is crucial to our argument (Engeström 1987). We distinguish expansion from mere quantitative increase or extension. For us, expansion is qualitative transformation and reorganization of the object. On
<table>
<thead>
<tr>
<th>Case 1</th>
<th>Economic crime treated as single-act mass crime</th>
<th>Ongoing economic crime that contains multiple acts</th>
<th>Multiple locations of crime, multiple agencies</th>
<th>Long-term crime, long-term parallel investigation</th>
<th>Map of flow of money between companies; project plan</th>
</tr>
</thead>
<tbody>
<tr>
<td>Case 2</td>
<td>Marketing object; one growing season</td>
<td>Integrated object; multiple seasons</td>
<td>Fields with green manures; advisory and administrative agencies</td>
<td>Farming across the years</td>
<td>Crop rotation plan; speech across the years</td>
</tr>
<tr>
<td>Case 3</td>
<td>Patient visit or care episode</td>
<td>Trajectory of care</td>
<td>Multiple interconnected caregivers</td>
<td>Multiple years of care, past and future</td>
<td>Care map; care calendar</td>
</tr>
</tbody>
</table>

Table 7.6

Transformation of the Object in the Three Cases
the other hand, expansion does not imply an abrupt break with the past or a once-and-for-all replacement of the existing object with a totally new one. Expansion both transcends and retains previous layers of the object. Expansion is not limited to the dimensions of time and space. It opens up and problematizes also the ideological-ethical dimension of power and responsibility and the systemic-developmental dimension that connects individual everyday actions to collective and historical transformations (see Engeström 2001; Hasu 2000).

But how do we explain simultaneous compression and expansion? It is useful to think of development in terms of multiple, partially interconnected, partially independent timelines (Scribner 1985). Hutchins (1995, p. 372) presents this idea with the help of a cube. The cube is a moment of human practice. In the cube, three divergent timelines cross each other: the relatively "slowly" progressing historical development of the practice, the somewhat more dense development of the individual practitioners, and the very dense moment-by-moment progression of the conduct of the activity. If we take the point of view of an individual in his or her career among and through multiple practices, compression of time and space is obvious. If we take the point of view of a given collective practice in its historical evolution, we see lots of recent indications of expansion of objects.

In other words, the question is: How do individuals experiencing compression in their careers grasp and deal with expansion of objects in collective practices? This question is more interesting and less pessimistic than lamenting compression or searching for enclaves where compression has not yet hit.

The temporal expansion of objects in our three cases seems to call for a remediation of the long-term and the instantaneous. The investigators of economic crimes, the organic farmers, and the medical practitioners and their chronic patients were all in the process of combining long-term planning and quick reacting to poorly predictable changes and contingencies in the lives of their objects. In each case, the practitioners had to construct plans and historical records that represented events spanning several years in time. But the trajectories of their objects also included surprise moves and emergencies. In musical terminology, with expanding objects, time needs to be both composed and improvised (on improvisation, see Barrett 1998; Weick 1998). While improvisation is quick, it is above all rhythmically focused. As Kessler, Bierly, and Gopalakrishnan (2001) and Leifer, O'Connor, and Rice (2001) show, it is crucial to distinguish between rhythmically focused speed and mechanically forced haste.

The socio-spatial expansion of objects in our three cases seems to call for a remediation of place and space. The space of information flows needs to be
crossed by means of concrete trails between places (for the concept of trails, see Cussins 1992). When tax inspectors and enforcement officers are placed as liaisons at police departments (such as tax inspector T1 in excerpt 2), they make trails between local agencies. The same is true of the organic farmers participating in educational events organized by administrators for farmers about the subsidy schemes or making phone calls to local and regional agricultural offices. And it certainly applies to the chief rheumatologist making a visit to the primary care health center, as well as to the rheumatologist, the primary care general practitioner, and the patient attending a laboratory meeting.

In all these cases, there were flesh-and-blood human subjects moving in space from one place to another and establishing trails that could be followed again, both by those subjects and others. Trails make an emergent knowable terrain, as if built from below. In the midst of all the fuzz about boundless spaces of flows, perhaps it is time to look closely at the formation of such terrains.

References


V

Do Inspection Practices in Organic Agriculture Serve Organic Values? A Case Study from Finland
Do inspection practices in organic agriculture serve organic values? A case study from Finland

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Abstract. In many European countries, organic agriculture has rapidly been transformed from a farmers’ movement to an institutionalized part of agricultural policy. In certification, compliance with published organic standards is verified through annual inspections on farms. In Finland, the role of advice in organic inspections has been the subject of debate. Two inspections are used here to show how the term organic was defined and what the role of advice in relation to compliance was. Both compliance and advisory types of interaction between the inspector and the farmer were identified along an axis from “input substitution” to “system redesign.” The findings illustrate the heterogeneity of the processes and definitions of the term organic in connection with inspections. System redesign was less obvious in compliance than items in inspection documents suggest. The physical surroundings and the methods used affect inspection practices. Institutionalization is not merely negative, but may also provide resources for system redesign. Whether advice is part of a new and emerging way of enforcing inspections is considered. The findings suggest that dialogue and negotiation are necessary in promoting system redesign and in enhancing the developmental functions of organic inspections.

Key words: Definitions of organic agriculture; Advice; Inspection practices; Institutionalization; Organic farming.

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Introduction

Organic agriculture is unusual in that a social movement has helped define what has become commercial and public standards for food (Campbell and Liepins, 2001). Initially, organic farming organizations developed their own production standards. However, in many European countries, organic farming has been institutionalized and regulated by national and international legislation (e.g., EU Council Regulation 2092/91). There is now a national organic regulation (NOP) in the USA as well. Standards and definitions of what is organic have been turned over to public policy.

Edvin Østergaard (1998: 54) suggests that organic agriculture can be viewed as a double phenomenon. On the one hand, it is a set of defined rules for farming practices. This implies a
closed interpretation of organic farming that is based on unambiguous criteria. Administrative standards, certification, and inspections require and promote a closed definition. On the other hand, organic agriculture is also considered as a variety of ideas and visions for a better way of farming. Here, “organic agriculture can be understood as a workshop of ideas for the development of new knowledge and perspectives that go beyond the limits of the defined organic form of farming . . . . this implies that interpretations of organic remain open and flexible” (Østergaard, 1998: 54, translation from Norwegian by LS).

Johannes Michelsen (2001) has analyzed the self-regulation of Danish organic farming under international (EU) public regulation. While public organic standards were necessary for the growth of organic farming, they also made organic farming associations lose control over production standards. According to Michelsen (2001), organic standards are temporary attempts to serve organic values or ideals. Michelsen (2001; 81) pointed out that the interests of public agencies and the manner of administration, which “seem to leave little space for administrators to accept and administrate the need for developing different solutions to similar problems in different environments, which is an integral part of organic farm management,” are an obstacle to regaining self-regulation in organic agriculture. By emphasizing self-regulation, as we understand it, Michelsen (2001) suggests the importance of openness in interpreting organic farming.

Julie Guthman (2000) assessed California organic farming practices and found that they often fall short of agro-ecological ideals. One of the main variations in applying agro-ecological principles is the availability of effective technologies to manage crop-specific problems. This in turn depends on how organic is defined, and she suggests the importance of organic regulations in shaping farming practices. Guthman (1998) criticized the organic farming movement for not questioning a technological approach that hampers the social and the ecological side of sustainability. Standards-oriented regulation often requires simplified technical solutions to complicated and hard-to-contain problems (Guthman, 1998: 142). Both Michelsen (2001) and Guthman (1998) seem to discuss how rules (that is, the closed character of interpreting the term organic) do not easily fit the organic ideal. However, they do not empirically analyze this point.

Organic agricultural production is controlled and certified through inspection. In most European countries, this is carried out by organizations accredited by IFOAM. The accreditation program for the regulation of organic certification bodies is based on the International Organization for Standardization (ISO) Guide 65 (IFOAM and IOIA, 2000). According to ISO 65, the certification body shall not give advice or provide consultancy services to the applicant. The International Accreditation Forum has issued the following ruling on this point: “The certification body is allowed to explain its findings and/or clarify the requirements of the standards, but shall not give prescriptive advice or consultancy as part of an evaluation” (IFOAM and IOIA, 2000, 8).

Despite this ruling, as the following section will show, there is still a desire for advice in Finnish organic inspections. We see this at least partly as a wish to maintain and promote the creative and open character of organic farming. Clearly, institutionalization (which means here that organic agriculture has become an established part of official national and EU agricultural policy) has diminished and called into question the role of advice in inspections. In this article we discuss advice and compliance as part of organic inspections. We will consider how organic farming is defined in the inspection practices. Is advice in inspections only a remnant from the past, or does it perhaps anticipate new and emerging inspection pattern?

The next section will first show the historical change in Finnish organic agriculture and inspections, and then outline some theoretical principles of this paper. We will then describe and reshape the concepts “input substitution” and “system redesign,” both used to analyze various definitions of organic farming in the inspections. The section about data from two farms will demonstrate the general schema of the inspections, and the methods will illustrate how the qualitative systematic analysis of the videotaped data was operationalized by the four key
concepts “compliance,” “advice,” “input substitution,” and “system redesign.” The findings will reveal the heterogeneity of inspection practices and definitions of organic, and that advice is not simply possible but indeed indispensable in organic inspections. Some of the influences of institutionalization, physical surroundings, and methods on inspections as well as the difficulty of inspecting system redesign will be discussed. At the end, we discuss the evolution of organic inspections and outline a possible new role for advice as an open, joint problem-solving dialogue between the inspector and the farmer. Empirical analysis from Finland is used to point out insights that are of general interest in research into the practice of organic farming and inspection.

Institutionalization of Finnish organic inspections

In Finland, organic inspections were started in 1986 by the Union for Organic Farming, the organic producers’ association. They were run by advisors from Rural Advisory Centers who were experts in organic farming. Inspections and advice were carried out together. In 1994, a year before Finland joined the European Union, the Finnish state took responsibility for organic inspections. The Plant Production Inspection Center of the state is now the only agency enforcing organic inspections in Finland. Organic inspections became part of a governmental, bureaucratic process. Organic farming grew and was granted a special subsidy in the Supplementary Protection Scheme (SPS), which is based on the General Agricultural Environment Scheme (GAEPS) intended for all farmers. Because organic agriculture was a relatively new form of production for most farmers, and because it was directed by complex administrative regulations, the need for advisory discussions during organic inspections continued. Inspections are carried out once a year on all organic farms, and are paid for by the farmers.

Fig. 1. Institutional development of Finnish organic farming.

In Finland, the role of advice in organic inspections has been a subject of debate.

From year to year they stress to us ever more clearly that an inspector inspects and does not give advice. Advising leads an inspector to become disqualified. Because of this and also because of the waste of time and money, you are not allowed to give advice during an inspection, particularly on production issues, and not perhaps on the regulations. (An organic inspector, interview, September 2001).
When asked whether an organic inspector can give advice during an inspection, one senior inspector replied,

Well it is part of the duty of an official to give advice on the matter in hand, so as to make things run smoothly. . . . But in my opinion it has to be connected with the regulations and how to comply with them rather than some kind of general advice; not that we can’t give it, but proper advising should not be expected of an inspector. Advising on the regulations and how to comply with them is part of the job.

(Senior inspector, telephone interview, November, 2001).

Organic inspection practices are a persistent concern of people in the organic industry in Finland (Viertola-Jern, 2002) as well as elsewhere (Buck et al., 1997; Campbell and Liepins, 2001; Michelsen, 2001). In Finland, regional Rural Advisory Centers offer chargeable extension services for organic farmers. Despite this, Finnish organic farmers want inspections to include advice. Most organic inspections are carried out by advisors who previously did the inspection job for the Union for Organic Farming, and who now work part-time for the Plant Production Inspection Center. According to the inspection manual of 1998, the main tasks of an organic inspector are to oversee the fields and book-keeping of the farmer, to report performance related to the organic standards, and to fill in the inspection reports. The annual decision about acceptance is made later at the regional Rural Department office (Heinonen and Kieksi, 1998).

In this paper, inspection and farming are analyzed as practical work activities. According to the cultural-historical activity theory applied, no activity simply follows standards and regulations from above, since workers continuously and actively shape and reshape the circumstances (Engeström et al., 1999; Haavisto, 2002). The organic regulation and control of “closed” character co-exist and intertwine with the more “open” and dynamic “self-regulation” that is going on in local farming practices. This is similar to Scott (1998: 310) stating that “formal order is always parasitic on informal processes, which the formal scheme does not recognize.” This paper is a systematic investigation of inspection practices involving both the formal and the informal aspects. What is essential is that, despite the power of administration, the outcome of this interaction is dynamic and open-ended.

Can the way inspection is carried out enhance some definition of organic, and by so doing direct the development of organic farming? In order to shed light on this broad question, we will consider how “system redesign” and “input substitution,” explained in the following section, come up in the inspection discussions. We wish to present evidence that institutionalization is not merely negative but may also provide new resources for system redesign.

“Input substitution” and “system redesign” as definitions of organic

Organic farming is often discussed in the context of sustainable agriculture (Goodman, 2000; Rigby and Cáceres, 2001; Campbell, 2001). Miguel Altieri and Peter Rosset (1996; Rosset and Altieri, 1997) outline two different strategies, agroecological system redesign and input substitution. The idea of system redesign is to build diversified production systems according to the ecological model of nature, in which interactions among their components maintain important properties of the production system, such as soil fertility, productivity, and resilience and resistance against crop failures. Input substitution means the replacement of the chemical inputs of conventional agriculture by biological ones. According to Rosset and Altieri (1997), this tendency prevails in sustainable agriculture and organic farming. The way of thinking is based on symptom suppression that does not address the ecological reasons for sustainability problems. Beside farmers, inspectors, traders and others in organic industry may also define organic farming according to either of these
concepts. If an organic inspector views his or her main duty as detecting prohibited inputs and substances, he or she implicitly or explicitly emphasizes input use in defining organic farming.

In their ethical inquiry, Verhoog et al. (2003) outline three main approaches to nature and naturalness in organic farming. One of them is “respect for the environment,” where conventional, chemical substances are replaced by more environmentally friendly and natural ones. This approach corresponds to input substitution. The second approach is “respect for the farm ecology,” which fits with system redesign. The third approach is respect for the integrity of life, emphasizing wholeness and harmony and adding spiritual understanding of nature and natural laws to analytical and ecological knowledge. The third approach mainly corresponds to ideas in biodynamic farming and our data does not enable us to consider it in this study.

Verhoog et al. (2003) describe the sequence of these three approaches as a process of inner conversion of farmers and consumers in the organic sector. We acknowledge and agree with these authors about the importance of recognizing these approaches in organic farming. However, this paper does not start from a linear, predetermined concept of development. Like the account of Campbell and Liepins (2001) on organic standards as a discursive field, our approach emphasizes the dynamic and contextual nature of defining the term organic. An important context in this respect is organic inspections. This paper looks at the definitions of the term organic in processes of interaction during on-farm organic inspections. Rather than individual people or farms, the interest is in organic inspection practices, which in turn may affect organic agriculture as a whole.

We apply Altieri’s and Rosset’s concepts “input substitution” and “system redesign” to choices farmers face in their everyday practices. Activity is dynamic: organic farmers are able to re-apply time and again the principles of system redesign, or to apply other strategies. This interpretation of these concepts allows the study of definitions of organic to be situational and near to the everyday life of farming and inspecting.

Data: organic inspections

The data consist of two inspections on the Kola and Alanen organic vegetable farms. Both farmers and inspectors vary considerably (See Appendices 1 and 2 for the main characteristics of both). The inspection documents and fields of the farm strongly mediate the interaction between farmer and inspector. Video-taped data enables us to observe and analyze this mediation. In the following, there is an account of the two inspections being analyzed that also reveals the general schema for the organic inspections.

The organic inspection included two parts: a walk in the fields followed by filling in the papers, which is mostly done inside the farm-house. During the field walk, the inspector, together with the farmer, went around all the field plots on the farm. On the Alanen farm, the inspector had the Production Inspection Report from the previous year, and the farmer had the subsidy application form for the current year for identifying the field plot, its crop, and acreage. On the Kola farm, documents were not used during the field walk. Both on the fields and inside, the usual procedure was that the inspector asked questions. Discussion also included advice, observations, reporting by the farmer, and stories.

After the field walk, the inspection documents were prepared in the house. The contact details of the farm, the main fertilizers used, and animals on the farm were recorded in the Production Inspection Report, as well as the acreage, crop, and variety from each field plot. The Inspector’s Statement about the Production Inspection included questions about crop rotations and plant propagation materials, additional fertilizers, and plant protection. The two inspections emphasized different items: inputs in the Kola inspection, and calculation of acreage on the Alanen farm. At the end of both inspections, the farmer signed the Production Inspection Report, and the inspector gave one copy of the Inspector’s Statement about the Production Inspection to the farmer. The
inspection visit lasted two hours and 40 minutes on the Alanen farm, and three hours and 45 minutes on the Kola farm.

Methods

The main analysis was taken from transcribed discussions between the farmer and the inspector, but observations of the fields, shown in the video-tape, have also been essential to the analysis. Ethnographical field research, important in interpreting the data, was carried on on these farms prior to this study (Seppänen, 1999). Interviews with officials in organic inspection, documents and literature have been used. This is a case study with two inspection cases (Hammersley and Gomm, 2000). The methodology applied is based on cultural-historical activity theory (Engeström, 1987; Engeström et al., 1999; Seppänen, 2002).

The inspection data have been categorized in two ways. First, inspection compliance and advice present in the inspection discussion have been examined. The content of the discussion, including ideas of system redesign and input substitution, have then been identified. An excel spreadsheet was used to categorize the data. The topics, including both inspection practices (compliance and advice) and definitions of the term organic (system redesign and input substitution), were then picked up. The four central concepts have been determined in the analysis of inspection data in the following way.

Compliance and advice

We use the word “compliance” to mean those topics that were discussed in order to satisfy the inspection purpose. It is possible to recognize the compliance topics because they are repeated on every field plot, deal with organic standards or other regulations, or are items on the inspection documents. Compliance does not refer to a form of conversation, but to the items dealt with in inspection.

Advice means that the inspector and the farmer discuss something the farmer should do or to take into consideration. Advice assumes some need or problem, either implicit or explicit, which is dealt with in some way in the interaction between inspector and farmer. In the data, advice means one or more of the following:

1. The farmer asks something related to his or her farming activity and the inspector answers the question. The topic is categorized as advice even if the answer is uncertain or does not correspond to the question.
2. The farmer reports his or her activity and the inspector brings in some new point of view. (If the inspector adds nothing new to the discussion, then the topic is not categorized as advice).
3. The inspector instructs, that is, offers information without being asked to.

In cases 1 and 2 above, advice includes negotiation. Compared to compliance, the essence of advice is some freedom of choice.

System redesign and input substitution

A topic is categorized as system redesign when it deals with managing biological interactions within the field system, such as crop rotation, organic nutrient management with green manure, clover grasses, farmyard manure and compost, or anticipatory weed control. As an example, talk about combating a weed using open fallow, or management of green manure for fertilization purposes are system redesign. The conservation of farmland biodiversity also manifests system redesign (see topic 10, Fig. 2).
Topics about inputs that could be replaced by local resources and system redesign are
categorized as input substitution.9,10 Talk about inputs are counted in the analysis even if the farm
did not use them. In this sense, the analysis is more about organic input rather than input
substitution as a strategy. There is one example of the latter from the Kola farm (Excerpt 1, topic
6 in Fig. 3).

Excerpt 1.11
Inspector: Has that [strawberry plot] had anything [fertilization]?
Farmer: No, it hasn’t had anything.
Inspector: OK.
Farmer: So, should it have something?
Inspector: Well, strawberries aren’t so [demanding of nutrients].

No input is mentioned by the interlocutors since “having anything” in excerpt 1 expresses the
input-type of thinking in which organic is defined by negation of using inputs. The topic is
categorized in the input-substitution region of Figure 3.

Table 1 below shows items of compliance as they were represented in Finnish inspection
documents in 1998. It also shows the type of items (input or system redesign). Because system
redesign here has a limited sense, being mainly those biological factors the farmers are able to
manage, many of these items cannot be grouped in this way (marked with a line in Table 1).
Some items such as plant protection may be either input or system redesign. Interestingly, the
items in the organic inspection documents emphasize system redesign more than input use.

| Table 1. Items of compliance in the inspection documents and how they relate to system
redesign and input substitution. |
<table>
<thead>
<tr>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Identification of fields, crops and varieties, and acreage</td>
</tr>
<tr>
<td>2. Farm contact details</td>
</tr>
<tr>
<td>3. Farmyard manure and other fertilizers</td>
</tr>
<tr>
<td>4. Livestock and animal density per hectare</td>
</tr>
<tr>
<td>5. Crop rotations</td>
</tr>
<tr>
<td>6. Plant propagation materials</td>
</tr>
<tr>
<td>7. Origin of the farmyard manure</td>
</tr>
<tr>
<td>8. Additional fertilizers</td>
</tr>
<tr>
<td>9. Plant protection</td>
</tr>
<tr>
<td>10. Book-keeping</td>
</tr>
<tr>
<td>11. Product storage and processing</td>
</tr>
<tr>
<td>12. Product packing and marking</td>
</tr>
<tr>
<td>13. Parallel production</td>
</tr>
</tbody>
</table>

Findings

Inspection practices and definitions of organic

The Alanen and the Kola data contain 20 and 21 topics respectively that can be grouped with the
dimensions built by the four concepts described above. The two inspections indeed differ a lot,
both in the definitions of organic and on the compliance-advice dimension. Inputs are emphasized
more in the Kola inspection, while system redesign is dominant in the Alanen data. The Alanen
inspection shows more advisory and the Kola inspection more compliance types of topics
(Figures 2 and 3). The categorization of the topics in these figures is deliberately made heuristically for easy visual comprehension. The distance of the topic numbers from the axes is not quantitative.

Fig. 2. Organic inspection of the Alanen farm analyzed in terms of the compliance-advice and input substitution-system redesign dimensions. The topics dealing with organic standards are underlined. The numbers refer to topics presented in Table 2.

Fig. 3. Organic inspection of the Kola farm analyzed in terms of the compliance-advice and input substitution-system redesign dimensions. No compliance could be identified in the field visit. The topics dealing with organic standards are underlined. The numbers refer to topics shown in Table 3.
Topics 1-11 of the Alanen data, and topics 1-10 of the Kola data are from the field plots or the journeys between them. The remaining topics were raised while filling in the inspection documents inside the house. The fields enabled both inspection compliance and talk about farming practices in general, while the documents inside the farmhouse made the conversation concentrate on inspection compliance. Advice was thus more common on the field walk than when preparing the documents. Altogether, in topics of pure compliance, input substitution (10/15) dominated over system redesign (5/15). Much less system redesign was present in compliance than the document items (Table 1) suggest.

Table 2. Topics in the Alanen data. The numbers refer to those in Figure 2. The topics in bold come from organic standards. The topics underlined include reference to other subsidy programs.

<table>
<thead>
<tr>
<th>Topic number</th>
<th>Topic</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Age of the ley in field 1</td>
</tr>
<tr>
<td>2</td>
<td>Mowing and tilling green manure, field 8, for the rye</td>
</tr>
<tr>
<td>3</td>
<td>Between fields: suitable crop rotation for new rented fields?</td>
</tr>
<tr>
<td>4</td>
<td>Field 12: mixed crop of peas and oats from the point of weeds</td>
</tr>
<tr>
<td>5</td>
<td>Field 18: piling up the mown biomass last year</td>
</tr>
<tr>
<td>6</td>
<td>Field 18: pest control (gauze) for planned carrot crop</td>
</tr>
<tr>
<td>7</td>
<td>Field 18: clover as a preceding crop for beetroot</td>
</tr>
<tr>
<td>8</td>
<td>Further actions in Field 19 with a weed problem</td>
</tr>
<tr>
<td>9</td>
<td>Between fields: nitrogen flow between green manure, soil and products</td>
</tr>
<tr>
<td>10</td>
<td>Between fields: what should be done to an abandoned pasture</td>
</tr>
<tr>
<td>11</td>
<td>Field 21: mowing the ley for fertilization purposes</td>
</tr>
<tr>
<td>12</td>
<td>In the house: planning a new crop rotation</td>
</tr>
<tr>
<td>13</td>
<td><strong>In the house: farm animals and animal density</strong></td>
</tr>
<tr>
<td>14</td>
<td>In the house: how different types of fallow are marked in the subsidy documents</td>
</tr>
<tr>
<td>15</td>
<td><strong>In the house: crop rotation</strong></td>
</tr>
<tr>
<td>16</td>
<td>In the house: origin of the farmyard manure and industrial production</td>
</tr>
<tr>
<td>17</td>
<td>In the house: how the problem of industrial production can be avoided</td>
</tr>
<tr>
<td>18</td>
<td><strong>In the house: plant protection (gauze)</strong></td>
</tr>
<tr>
<td>19</td>
<td>In the house: plant protection (mowing the fallows)</td>
</tr>
<tr>
<td>20</td>
<td><strong>In the house: use of additional fertilizers</strong></td>
</tr>
</tbody>
</table>
Table 3. Topics in the Kola data. The numbers refer to those in Figure 3. The topics in bold come from organic standards. The underlined topics include reference to other subsidy programs.

<table>
<thead>
<tr>
<th>Topic Number</th>
<th>Topic</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Between fields: the realization of the crop rotation should be made visible in the inspection documents</td>
</tr>
<tr>
<td>2</td>
<td>Field 3: do the carrots need additional fertilization?</td>
</tr>
<tr>
<td>3</td>
<td>Field 4: growth of the carrot under gauze</td>
</tr>
<tr>
<td>4</td>
<td>Field 5: how to get rid of sow thistle (Sonchus sp)?</td>
</tr>
<tr>
<td>5</td>
<td>Field 7: what should be done with a weedy green manure?</td>
</tr>
<tr>
<td>6</td>
<td>Field 8: should strawberry get something [fertilization]?</td>
</tr>
<tr>
<td>7</td>
<td>Field 17: what should be sown for the winter?</td>
</tr>
<tr>
<td>8</td>
<td>Field 18: would a companion crop have helped in establishing the ley?</td>
</tr>
<tr>
<td>9</td>
<td>In the house: has biotite been used this year?</td>
</tr>
<tr>
<td>10</td>
<td>In the house: the amount of Biosol fertilizer used</td>
</tr>
<tr>
<td>11</td>
<td>In the house: how should the Production Inspection Report be written so that the correct preceding crops become visible?</td>
</tr>
<tr>
<td>12</td>
<td>In the house: the quality of the chicken manure used</td>
</tr>
<tr>
<td>13</td>
<td>In the house: on which crops have additional fertilizer products been used?</td>
</tr>
<tr>
<td>14</td>
<td>In the house: is the lime used acceptable in organic production?</td>
</tr>
<tr>
<td>15</td>
<td>In the house: the name of the lime producer is needed / what happens if the lime is not acceptable?</td>
</tr>
<tr>
<td>16</td>
<td>In the house: what is the product name of the seaweed used?</td>
</tr>
<tr>
<td>17</td>
<td>In the house: the inspector reads accepted product names from the organic inspection manual</td>
</tr>
<tr>
<td>18</td>
<td>In the house: gauze in plant protection</td>
</tr>
<tr>
<td>19</td>
<td>In the house: a biological pesticide (pyrethrine) against insects</td>
</tr>
<tr>
<td>20</td>
<td>In the house: crop rotation</td>
</tr>
<tr>
<td>21</td>
<td>In the house: does the farmyard manure come from industrial production?</td>
</tr>
</tbody>
</table>

Some topics include both advice and compliance talk about the same items (see sub-groups on the input substitution-system redesign-axis, Figures 2 and 3). In these subgroups, advice is mostly instruction, while topics in other advice groups include dialogue and negotiation. During the Alanen inspection, there was very little input substitution, but a lot of advisory topics in system redesign. These are divided into two sub-groups. In the sub-group “advice about farming” (topics 3, 4, 7, 8, 9 and 12 Fig. 2), the need or the problem to be solved comes from the farming activity. In the other sub-group, “advice about subsidy rules” (within the same quarter, Fig. 2), the topics deal with administrative rules not specific to organic farming. The inspector did not include these rules in the inspection.

Of the categorized Alanen and Kola topics, 32% and 57% respectively stemmed from organic standards. All concerned compliance, mostly in input substitution but also in system redesign. Some topics (21% of the Alanen and 10% of the Kola) referred to other subsidy programs than organic standards, that is, the CAP and GAEPS. Interestingly, all the topics reflecting items from other policy programs than organic were of the system redesign type.
Compliance as advice

The analysis above includes only those compliance or advice topics where input substitution or system redesign are dealt with. Here we will change the unit of analysis and describe an occasion from a remote field plot of the Alanen farm in which compliance was also advice. The field in question was problematic from the point of view of both inspection and farming. The farmer thought that this field was designated an open fallow\textsuperscript{14} in the subsidy application.

On arriving at the field, the inspector and the farmer encountered weed vegetation. The inspector said: “This is not under any circumstances an open fallow at the moment.” This remark was compliance but it was simultaneously advice because the inspector was correcting what the farmer thought it was. From the point of inspection, the problem was that the crop identified did not correspond, as it should, to what the farmer said. The inspector solved this problem by identifying the crop (or, in fact the fallow type) according to his own observations.

After talking for a while about the identification, the inspector said: “Well, yes. Like, I thought, what was the idea with this field plot then . . .” The inspector thus changed the topic to what the intentions of the farm as regards this remote and neglected field were. He changed directly to the object of the farming activity. From the point of farming, the direct problem of the field was the weeds. The discussion was followed by the system redesign type of advice (topic 8, Fig. 2) in which they both actively negotiated what crops to grow there and what actions to take to get rid of the weeds. It was important from the farming point of view, but it was not beyond the scope of inspection. Without advice and actions by the farmer the inspection problem might have continued for years.

Ways of dealing with system redesign

The focus here will be on crop rotation as a core example of system redesign. We will list and demonstrate the ways in which crop rotation was dealt with in the two organic inspections.

1. Checking the actual and preceding crops in the fields. This is an item of compliance and can be seen as identifying a stage of the crop rotation sequence. In the field walk during the Alanen inspection, the inspector carried the inspection documents with him. He checked the preceding crop on each field, and recorded the actual crop on the inspection document.

The Kola inspector, before the field walk, emphasized the need to put on record the crop sequence of each field. This, she said, was necessary for the inspection body (other than herself) to evaluate the crop rotation of the farm. However, she did not carry the documents with her in the fields. At nearly every field plot she asked, “What was grown here last year?” but it is not obvious that this question was aimed at understanding the crop rotation. In neither inspection was the checking the preceding and actual crops connected to the crop rotation item.

2. Planning a future crop rotation. On a journey from one field plot to another, the Alanen farmer asked whether a certain type of crop rotation would be good for the fields he had planned to rent (topic 3, Fig.2). The inspector gave advice, reflecting on some alternatives, and the farmer threw in some ideas. The topic of crop rotation ceased immediately when the farmer and the inspector entered the next field.

Inside the Alanen farm-house, the inspector asked if the previous local advisor had drawn up the crop rotation plan, and briefly suggested that it would be timely to make a new one, perhaps during winter months (topic 12, Fig. 2). Here, the inspector found a market for his work as an extensionist. Both of these examples are advice.

3. Filling in the crop rotation item in the documents. As compliance, crop rotation is recorded in the inspection document as a list or a temporal sequence of crops. This was done inside the farm-house on both inspections. At the Alanens, the inspector started by assuming a common start, cereal undersown with a clover-grass mixture. The farmer responded to this by wanting to
negotiate his recent ideas for crop rotation. The agenda of the inspector was different since he mainly wanted to speed up the filling in of the documents and just to write down the crop sequence. These different agendas caused misunderstandings in documenting the crop rotation that were only partially corrected (compliance, topic 15, Fig. 2). The crop rotation item was documented on the Kola farm in a quick check-list mode similar to the Alanen inspection. The farmer did not remember the planned rotation and was looking for it in her papers. The crop rotation was documented just as it was in the plan (compliance, topic 20, Fig. 3).

Discussion

The activity-theoretical analysis of the organic inspections reveal that in practice, inspections do not appear in a “pure” form. Even though the document items are the same, they are interpreted and acted out in different ways. We will discuss four general aspects of inspection practices in the light of the findings. The first is how institutionalization into the subsidized EU administration influences organic inspections. The second is the material surroundings and tools used in inspections. Thirdly, some aspects of system redesign in inspections will be discussed. Finally, we explore what the role of advice in the evolving practices of organic inspections is, and compare the findings to research in another domain.

The influence of institutionalization in organic inspections

Institutionalization has meant increased bureaucracy in the inspection and certification process. Because organic subsidies are part of the wider EU subsidy system, the boundary between organic and EU inspections is unclear. In practice, this is seen in the importance of checking the actual crops and acreages. It also means that other subsidy programs, such as the GAEPS and the CAP, are involved in organic inspections.

The subsidy administration has an increasing impact on organic farming. Together with EU regulations, new administrative concepts and ways of thinking are entering organic farming. They may be brought into organic inspections both by the inspectors and by farmers’ questions and comments. Interestingly, the topics concerning new EU regulations appeared within system-redesign advice. To some extent, system redesign was promoted by regulations and programs other than organic standards, which apparently changes the content of system redesign. The traditional organic view of nature is to emphasize soil fertility and the ecological ideas of the farming system (Kaltoft, 1999). CAP and GAEPS regulations and recommendations convert system redesign into avoidance of harmful environmental effects, similar to what Tovey (1997) has reported from Ireland. In any case, strengthening system redesign can be seen as a possible positive effect of environmentally-directed institutionalization. The new EU regulations being discussed in advisory mode, further stresses the importance of the free exchange of ideas by negotiation and dialogue in promoting system redesign.

How do material surroundings and tools direct inspection practices?

Advice often appears separately from compliance. It seems that this type of advice depends on the location of the inspector and the farmer, or what they use, such as the inspection documents. During the field walk, the common object of inspector and farmer, the fields, are physically present. The visible object allows the participants to recognize a problem and engage themselves in joint attempts to find a solution. This turns the hierarchical question-answer mode of interaction into a more symmetrical and co-operative mode (Virkkunen, 1991).

However, the analysis shows that advice is subordinated to compliance. For instance, advice about crop rotation (topic 3, Fig. 2) broke off immediately on arriving at the next field to be
inspected. The journeys between the fields make the inspection discontinuous in time. Rather than constraining, these discontinuities offer opportunities for advice or other free types of discussions. This is in contrast with the increasing demand for efficient time use during inspections.

Another type of relation between compliance and advice is the topics on the input substitution-system redesign axis (Figures 1 and 2). Here, the topics are mainly brief comments about the rules and how to put them into practice. Much of this type of advice appeared inside the farm house when filling in the inspection documents. The documents strongly direct the discussion in content and time. Unlike fields, the documents are not visible to both farmer and inspector, and therefore do not encourage joint dialogue.

Sometimes advice cannot be distinguished from compliance. This is probably the case with problematic fields and items. Advice can be a means of completing the inspection. From this perspective, separation of advice from inspection is artificial.

The difficulty of inspecting system redesign

System redesign is based on local resources and their interactions, which is a challenge for inspection. It is considerably easier to inspect inputs bought to a farm than the local design of the farming system. According to Michelsen (2001: 81), as stated in the introduction, the logic of administering public rules leaves little space for developing different solutions to similar problems in different environments. These “different solutions” are a key element in system redesign. Our analysis shows that system redesign was less present in compliance than items in the inspection documents suggest.

Crop rotation, as a crucial element in system redesign, defines organic in a positive way (compared to the negative definition of avoiding prohibited inputs). The documentation of preceding and actual crops seems to be treated as beyond the item of crop rotation. The crop sequence was reported in the documents, but it may remain detached from what happens in the fields. It seems that compliance does not enable the farmer and the inspector to observe and assess the crop rotation of the farm together. In these inspections, this was done in the sphere of advice.

The principles and actions necessary in organic farming are conceptualized in a specific “organic language.” This originates more from organic farmers than agricultural scientists. The use of green manures and clover-grass mixtures in nutrient mineralization is central in this respect. It seems that if inspectors master this organic language, it encourages system redesign.

Advice in inspections – old or new?

The advice in inspections can be seen as a remnant of the time when inspections, enforced by the Union for Organic Farming, were run together with advising. The instructions to inspectors to avoid advice were only introduced after 1998. Analysis of the changing role of advice would thus require additional research with newer data. However, in the long run, advice may also manifest new and emerging inspection practices.

Jaakko Virkkunen (1991; 1995) has researched and organized developmental projects for Finnish labor protection inspection. Labor protection inspectors developed a new form of inspection dialogue that prompted representatives of work places to state their analyses of the main safety problems and their causes. They also created new methods to jointly collect and analyze data. The new methods encouraged teamwork among inspectors and led them to broaden their approach from the norm-condition comparison to a joint inquiry into the causes of recurrent problems and finding generally applicable solutions to them (Virkkunen and Kuutti, 2000). Labor
protection inspectors understood their work in broader terms than just “regulations and how to comply with them,” as remarked by the senior inspector in the introduction of this paper.

With labeling, organic inspections bring market advantage to certified organic farms, which is not the case with labor protection inspections. Despite this difference, it may be useful to consider what the labor protection example above would imply for organic inspections. It would mean assessing and analyzing the problems expressed by farmers and observed on farms, and how they may be linked with violations of organic standards. This analysis needs to be carried out by dialogue and negotiation between the inspector and farmer. Apart from detecting fraud, the purpose of organic inspections could be to anticipate malpractices.

We started our analysis with the concept of advice. However, the findings and the discussion reveal that the essential in “advice” is not merely top down instruction, but a joint analysis and negotiation of problems that is open and enables many types of interpretation. On a small scale, this may provide the creative “workshop of ideas” proposed by Østergaard (1998). When organized systematically and consciously developed, advice in inspections could reinforce the dialogue between the formal, closed regulation, and the informal, more open “self-regulation” that is going on in local farming practices. We argue that to do a good job, inspectors need to go beyond the regulations and accept some responsibility for developing organic agriculture. In many fields of public policy, such as court work (Haavisto, 2002), economic crime investigation (Puonti, 2003), and agri-environmental policy (Aarts and Woerkum, 1999), there are signs of a shift towards increased collaboration and joint negotiation.

Conclusion

Organic inspections include diverse practices and definitions of the term organic. The findings show that system redesign is less present in compliance than items in inspection documents suggest. Advice in organic inspections is possible and sometimes indispensable. Our analysis supports the idea that advice, in which problems and their causes are jointly discussed in inspections is needed both for promoting system redesign and for enhancing anticipatory and developmental functions of organic inspections.

Appendix 1. Farms inspected, 1998. In the Alanen inspection, the male farmer, and in the Kola inspection, the female farmer attended the inspection. The average Finnnish farm, in 1998, included 21.7 hectares of fields (Sirén, 1999).

<table>
<thead>
<tr>
<th></th>
<th>Alanen farm</th>
<th>Kola farm</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fields /hectares</td>
<td>About 22</td>
<td>About 10</td>
</tr>
<tr>
<td>History before organic farming</td>
<td>Dairy</td>
<td>Greenhouses</td>
</tr>
<tr>
<td>Conversion to organic started</td>
<td>1991</td>
<td>1991</td>
</tr>
<tr>
<td>Contact with organic community</td>
<td>Intensive</td>
<td>Low</td>
</tr>
<tr>
<td>Farmers: age and gender</td>
<td>Male (41); his wife (35) works outside farm</td>
<td>Female (48) and male (59); both work on farm</td>
</tr>
<tr>
<td>Actual sold products</td>
<td>Potato, Chinese cabbage, rye, wood</td>
<td>Onion, carrot, potato, and various other vegetables</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>Alanen inspector</th>
<th>Kola inspector</th>
</tr>
</thead>
<tbody>
<tr>
<td>Education</td>
<td>Agriculture, college level</td>
<td>MSc in agronomy (plant pathology)</td>
</tr>
<tr>
<td>Gender and (age)</td>
<td>Male (28)</td>
<td>Female (31)</td>
</tr>
<tr>
<td>Contact with “organic community”</td>
<td>Close</td>
<td>Beginning</td>
</tr>
<tr>
<td>Occupation</td>
<td>Extensionist in a rural advisory center</td>
<td>Extensionist in a rural advisory center</td>
</tr>
<tr>
<td>Number of previous organic inspections carried out</td>
<td>About 50</td>
<td>4</td>
</tr>
</tbody>
</table>

Notes
2. In 1998, 5.5% of the Finnish farms were covered by organic farming inspections and 5.8% of the total arable field acreage was certified organic or under conversion to organic farming (Plant Production Inspection Centre, 2000).
3. The Supplementary Protection Scheme (SPS) requires more efficient environment protection measures than GAEPS. Organic farmers subsidized by SPS also need to fulfill the basic GAEPS regulations, which include headlands or filter strips on the sides of ditches and water courses and, in Southern Finland, a winter coverage or minimum tillage of 30% of the arable land (Kettunen, 1998).
5. The names of the farms are fictional.
6. It is obvious that the education of both inspectors and organic farmers is important. The aim of the paper is not to find out how the parameters of the inspectors or of the farms affect inspections. There are forces that control the inspection practices, no matter what knowledge or beliefs the parties involved have. This study aims at revealing these forces.
7. The main text analyzed amounted to 208 pages and about 58,000 words.
8. Beside activity theory, practices are being studied in the fields of ethnomethodology (Lynch and Jordan, 2000; Suchman, 2000), actor-network theory (Kaltoft, 1999), pragmatism-based approaches (Paine, 1999), and management studies and cognitive ergonomics (Hémidy and Cerf, 2000).
9. The boundary between substitute and indispensable inputs is unclear. For instance, Chinese cabbage seed and tractors are not optional inputs, because they are inevitable in production, and their production is not possible locally, at least in the short term.
10. There are three data items that could be categorized either as system redesign or input substitution. The first of these is the inoculation of seeds. The second is farmyard manure from outside the farm, and the third is subsidies. They are potentially replaceable because it is possible to obtain income without them. The subsidy rules markedly condition system redesign by greatly affecting land use. All these three items are excluded from the analysis.
11. Excerpts and samples have been translated from Finnish into English by Fred Gates and Laura Seppänen.
12. Parallel production means growing the same crop or an indistinguishable crop variety both organically and non-organically by the same farm.
13. The CAP (Common Agricultural Policy) of the EU includes a subsidy scheme for arable crops and livestock. It includes environmental recommendations (Ministry of Agriculture and Forestry, 1998).
14. Open fallow means that the field is tilled to control the weeds several times during the growing season. Bare soil is seen in open fallow if it is managed properly. A green fallow means that a mixture of grasses and legumes is sown in order to fertilize and/or improve the soil.
15. This is related to what Turnbull (2000, 65) states about the construction of a Gothic cathedral. The time waiting for the mortar to dry offered the masons important time for further planning of the construction.
16. Often, especially in organic vegetable farming, crop rotation cannot be carried out as planned. From the point of view of system redesign, the changes in crop rotation plans are important, and administering the changes requires flexibility and negotiation.

References


VI

Creating Tools for Farmers’ Learning: an Application of Developmental Work Research
Creating tools for farmers’ learning: an application of developmental work research

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Abstract

This paper describes how the methodology of developmental work research, originating from cultural–historical activity theory, was applied in an intervention study of organic vegetable farming. Analysis of disturbances occurring in practice and of the developmental histories of two farms served as basis for modeling organic vegetable farming as an activity system. Contradictions within the activity system revealed that sustainable use of natural resources on the one hand and entrepreneurial integration into society on the other hand were the two major learning challenges faced by the farmers. Learning tools created and used in the study are the special focus of this paper. These are the models of an activity system, the zone of proximal development, strategies for increasing product volume and three orientations towards farm workers. The methodology offers means for problem definition in research and development projects, and enables the formation of non-deterministic directions of development for organic vegetable farms. © 2002 Elsevier Science Ltd. All rights reserved.

Keywords: Learning; Organic vegetable farming; Developmental work research; Activity theory; Systems methodologies

1. Introduction

“Sustainable agriculture is not an ‘innovation’ that farmers ‘adopt’. Changing to more sustainable practices is more like a paradigm shift, involving a learning path
leading to new perspectives on risk avoidance, new professionalism, a greater reliance on one's own expertise and observation..." (Röling and van de Fliert, 1994). This is true of organic agriculture in Finland today, which is a young but rapidly growing sector. Its institutional infrastructures and technologies are as yet undeveloped. Therefore, organic farmers themselves have to carry a lot of responsibility for the sector's development. Organic farming in itself presents major learning challenges to its practitioners. This is especially the case in organic vegetable production, where the majority of farmers are learning both organic farming and vegetable production at the same time.

Besides organic farming, the whole Finnish agricultural sector is in transition. Within the European Union, agriculture is, on one hand, entering a more open market economy, and on the other, is more dependent on direct subsidies and their regulations. Environmental aspects bring additional challenges for farmers. In Finland, the former closed and protected agricultural sector is increasingly opening and struggling to become more entrepreneurial. Because of these changes, the number of Finnish farms is estimated to have decreased remarkably (Niemi et al., 1995).

In a complex situation like the one described above, how can R&D (research and development) workers identify the most relevant problems? In 1995, our project, called Participatory Development of Organic Vegetable Farming, faced this question. The objectives of the project were to identify the main problems facing this relatively new kind of farming activity, to develop initiatives to solve them, and to test participatory ways of working with 15 farming families and their advisors (Seppänen et al., 2000).

The farmers involved face many problems. Not only were the problems highly diverse and specific, but the farmers and other actors had varying views on their relative importance. The various agricultural disciplines did not seem to be able to help in prioritising problems in an objective way. This prompted us to search for new methodologies for agricultural research, a need that is expressed worldwide in the literature (cf. Bawden, 1991; Kloppenburg, 1991; Ison et al., 1997). For the purpose of conducting a deeper analysis of organic vegetable farming together with two farmer families, the methodology of developmental work research (Engeström, 1987) was selected. This is the first time the methodology of developmental work research has been used in agricultural research.

In developmental work research, the key concept is a collective activity, which evolves in cycles or spirals over long periods of time. Changes in an activity are analyzed with a model of an activity system. The formation of qualitatively new activity patterns takes place through expansive learning (Engeström, 1987). Contradictions within an activity system are considered fruitful potentials for change and development. The methodology is contextual and participatory with an emphasis on educational interventions. Developmental work research has been applied in the study and development of organizational systems such as health care, administration, education and business enterprises (Engeström et al., 1996; Virkkunen, 1996; Koistinen and Kangasoja, 1997; Engeström, 1999; Miettinen, 2000).

In this paper, organic vegetable farming is analyzed at two levels: at the level of the collective activity, which is a higher level of systemic hierarchy, and at the more
specific level of individual actions, such as planting and harvesting. The activity is
driven by a cultural motive, in this case, of producing good quality organic vege-
tables. Individual farmers perform actions in which they experience problems and
disturbances.

In developmental work research, the researcher helps the practitioners to identify
and formulate challenges for their learning and development and to create expansive
solutions. The researcher’s role is not only to point out problems and opportunities.
He or she makes explicit what he/she thinks is good and preferable within the local
farming activity being studied. What is ‘good and preferable’ emerges from an ana-
lysis of the historical development of that activity. However, the researcher’s views
do not have any priority over those of the other actors.

The overall theoretical aim of this paper is to show the linkages between activity
systems and specific actions, and how these two levels can be used in promoting
farmers’ learning. Besides this, the paper has three specific aims:

1. To outline how the methodology of developmental work research can con-
tribute to the study of farming.
2. To explain tools that may be used to analyze and discuss farmers’ learning
challenges, both at the level of activity and that of actions.
3. To provide a theoretical analysis of some developmental challenges facing
Finnish organic vegetable farmers and their possible solutions.

The paper first describes the methodology used and the farms studied. After that it
shows how the disturbances and contradictions in the organic vegetable farming
activity were identified and what learning tools were created and used to improve the
farmers’ understanding of their activity and its developmental challenges. Finally,
the paper discusses the findings and the question of their generalizability.

2. The methodology

2.1. The farms

The two farms in the study exemplify different types of farming cultures within
vegetable production and therefore raise, respectively, different types of problems.
Both converted to organic farming in 1991 and started with vegetable production
some years later. Both are family run farms but each converted in unique ways and
from different starting points. These farming families took part in the intensive
study during 1997 and 1998.

The Kola\(^1\) farm is 9 ha and the growers, Maria and Kai Kola, used to produce
flower bedding plants in greenhouses. The farm is situated in southern Finland,
about 50 km from Helsinki, the capital. They now produce organic vegetables, with
demand for their products being the key driving force behind their new farming
activity. The Kolas sell the vegetables directly to retail markets.

\(^{1}\) The names are fictional.
The Alanen farm comprises 22 ha, and was originally a conventional dairy farm. The farm is situated about 250 km northeast of Helsinki. It is farmed by Antti and Eeva Alanen, although Eeva also has worked off-farm since 1996. The couple belongs to a farmer-owned marketing company that sells vegetables to wholesale markets. Potatoes are also sold to local customers directly from the Alanen farm. The continuity of the farming activity over generations is important to Antti, and this is reflected in his ideas of maintaining and improving the soils.

2.2. The methodology

Developmental work research is based on cultural–historical theory of activity (Chaiklin et al., 1999; Engeström et al., 1999). Its main theoretical principles can be crystallized as following:

1. The unit of analysis is an activity system (Fig. 1). Its structure was developed by Yrjö Engeström (1987) from the ideas of Leont'ev (1978) and Vygotsky (1978), two prominent Russian psychologists and founders of cultural–historical activity theory. The activity is an object-oriented, culturally and materially mediated system, with division of labour and rules that regulate interaction between the participating individuals. The distinction between actions of individual practitioners and collective object-oriented activity is of central importance. The activity system, including its motive, is more durable and complex than discrete actions. Actions can only be understood in relation to the object and motive of an activity system.

2. The object of activity is transformed, both discursively and materially, into an outcome or a product. Phenomena in the world become objects when they are brought into the sphere of human activity (Miettinen, 1998). A collective activity is driven by a deeply communal motive, which is embedded in the object. The object is constantly changing; the individuals participating in the activity take part in its historical construction.

3. The model of an activity system makes it possible to identify and analyze its inner contradictions within and between the elements of an activity system. Contradictions are tensions between forces pulling to opposite directions in the

![Activity System Diagram](image)

Fig. 1. The structure of an activity system.

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2 In 1997, the average field size in Finnish farms was 24 ha (Sirén, 2000).
activity. As an example, there can be a contradiction between a short-term and intensive vs. an ecological and sustained use of resources in the farming activity. Contradictions have to be resolved somehow, therefore they are a fruitful potential for change and development. Contradictions of activity manifest themselves through disturbances and ruptures in practitioners’ everyday work actions.

4. Major qualitative changes in the activity system happen through *expansive learning*, in which the object and the whole activity system are transformed. Expansive learning is collective and takes long periods of time. It begins when participants start to question the aims of activity, what is produced and why. In expansive learning, the practitioners create a new mode of practice that was not there at the outset. This type of learning is little discussed in standard learning theories.

5. Expansive learning is not a predetermined course of one-dimensional development. It is something that no authority is able to transmit and teach. What is more advanced cannot be decided using externally given, fixed yardsticks. Therefore, it is necessary to determine locally a *zone of proximal development* (ZoPD), which shows the possible directions for solving the existing contradictions within the activity system (see item 3 earlier). The zone of proximal development is the distance or the area between the individually experienced present and the collectively generated foreseeable future activity in which the contradictions are expansively resolved. The concept of ZoPD was originally invented by Vygotsky (1978), and was later reinterpreted by Engeström (1987).

The methodology of developmental work research consists of an analytical cycle, or spiral, of five sequential steps (Engeström, 1995; Table 1). Once one cycle has finished, a qualitatively new one starts again with step one. Table 1 lists the methods used at each step to analyze the farming activity, most of which are common in developmental work research. Finally, the table lists specific tools used together with the participating farmers. The visual models of the ‘zone of proximal development’, ‘strategies for increasing product volume’ and ‘three orientations towards workers’ were created for this study and will be discussed later in this paper (Figs. 4–6).

To date, steps one and two have been completed on both farms. Step three has been completed on the Kola’s farm in the form of a new crop rotation plan (Section 7). On the Alanen farm, there were preliminary attempts to implement a new activity (step four).

3. Disturbances in farming actions

It is vital for a researcher to work at field level to understand the farming enterprise and its problems, because learning should start from where the farmers are. In the methodology of developmental work research, problems experienced at the level of concrete actions are called disturbances. In most cases, disturbances do not undermine the farms’ viability, but often waste time and can negatively affect the
quality or quantity of the products. Disturbances can be identified by interviewing the farmers, but also by participant observation of the farming activity to reveal issues farmers might not have noticed.

To exemplify disruptions of actions, I shall give a sample disturbance from each farm. In 1998, the Kolas started to cultivate vegetables in a newly rented field plot. The preceding crop in 1997 had been clover grass and in 1996, spring wheat with the clover undersown. They sowed the carrot to the part of the plot with a suitable soil type. After the seedlings had emerged, the Kolas noticed that the carrot plot was infected with a strong growing vegetation of couch grass (*Elymus repens*). Therefore, they had to sow the carrot again to another part of the field plot. Even there they had to work hard to suppress the couch grass.

On the Alanen farm, the Chinese cabbage was planted in July 1998. After some days of intensive manual planting work, Antti gave the workers a half-day off to rest. The next day he heard that the workers had gone, on their own initiative, to ask for work on a neighbouring strawberry farm, hoping to earn something extra during the time off from Antti’s work. Because of this incident, Antti suffered a delay in planting, and his workers were tired. Disturbances such as these, and their influence on the farming outcomes, were discussed with the farmers using field reports and little stories. To understand why these disturbances arose on the Kola and the Alanen farms, we have to turn to the broader context of the activities of the farms and their histories (Sections 4 and 5).
4. Developmental histories of the farms

4.1. The Kola farm

Maria and Kai Kola’s personal interest in organic farming dates back to the 1980s. In the early 1990s, Maria and Kai were tired of the heavy workload involved with greenhouse flower bedding plants. The demand for the bedding plants was also expected to decline in the future, leading the Kolas to change their activity. In 1991, they converted their fields to organic cultivation and started organic vegetable farming few years later. As they had success with new customers, the area under organic vegetables increased each year. In 1996, the Kolas rented new fields and aimed at large-scale, mechanized organic vegetable production. The increase in organic vegetable production made it difficult to continue with the conventional greenhouse flower production, because the busy flower selling season overlapped with the sowing and planting time in spring. Therefore, they gave up greenhouse production in 1997.

The Kolas’ previous activity, greenhouse production of flowers, was market- and business-oriented. While these features were also needed in the new activity of organic vegetable farming, the two forms of production differ in nature, in their temporal cyclicity and control of the production. The new production of organic vegetables was large-scale and mechanized, while the earlier greenhouse production had been practised as a ‘craft’. In the greenhouses, the Kolas had had three production seasons per year, while organic farming requires a long-term perspective covering many years and production seasons. In the greenhouse, the environment is well-regulated and the procedures standardized. In organic vegetable farming, the production depends much more on local natural resources, and its control of production is based on anticipation and planning rather than on any standard guidelines.

4.2. The Alanen farm

Antti Alanen took the farm over in 1982 when it was still focused on conventional milk production. As Antti needed to increase income to cover debts arising from the farm purchase, he started cultivating potatoes. However, potato cultivation necessitated numerous plant protection sprayings, which Antti disliked thoroughly. This was an important incentive to convert the farm to organic agriculture in 1991. During the 1990s, the Alanen family learned organic cultivation techniques and started to produce vegetables, such as carrots, onions and Chinese cabbage. In 1995, animal production was stopped due to allergies, diminished profitability and a desire to avoid investments to a new cowhouse. The same year Antti, together with other organic farmer colleagues, founded a marketing company.

Milk production had required a relatively even work input, whereas organic vegetable production comprises many intensive labour peaks, requiring hired labour. In milk production, the need for marketing and accounting was minimal. The milk price, being negotiated annually between the state and the farmers’ union, remained fairly stable. In vegetable production the price depends heavily on supply
and demand, and the grower bears the risk. Besides, in vegetable production, farmers do the invoicing and accounting themselves. The Alanens' new organic vegetable farming required a closer linkage between the farmers and their customers, and with the society in general, than the conventional dairy farming. In the old way of working, the activity was more closed and continuous, whereas the current activity is undergoing constant change.

5. Activity systems and contradictions

Within the frame of developmental work research, collective activities are systemic and comprise various interrelated elements. This section applies the activity system model, presented in Section 2.2, to organic vegetable farming. The subject is an organic vegetable farmer or a farmer family. The object of organic farmers consists of what they are working on in the production: soil and plants, vegetables and customers. The societal motive for vegetables being cultivated organically is embedded in the historically evolving object. Ten years ago organic vegetables were produced mainly on a small scale, as an addition to other lines of production on organic farms. Ever since, organic vegetable production is increasingly becoming a specialized and mechanized industry. Moreover, each individual farmer constructs his/her own interpretation of the object. Some farmers see organic vegetable production as a business, while others emphasize sustainability of resource use as a central value in its own right.

The model of an activity system (Fig. 1) helps farmers and R&D workers see how systemic interactions between the elements contribute to the nature of the farming activity. Contradictions emerge within and between the elements, serving as potential sources of learning and development. Below, an example is given from both the Kola and Alanen farms. The analysis shown in Figs. 2 and 3 is based on the actual disturbances (Section 3), and on the historical analysis of the farms (Section 4).

The old form of activity (greenhouse production) still influences in the object of the activity through Maria’s and Kai’s spatial and temporal conceptions of farming (Fig. 2). This represents the ‘short-term and intensive use of resources’ side of their object. Yet, in organic farming, obtaining good yields and sustaining the farming system requires long-term management using conceptual tools such as crop rotations (Altieri and Rosset, 1996). Therefore, other side of the object is ‘ecological and sustained use of resources’ which presents a challenge of expansion for the Kola farmers. Spatially, the expansion means taking good care not only of the vegetable fields but of the fields with green manure as well. Disturbances concerned with soil and weeds reveal the challenge of this expansion.

Expansion in the object requires that Maria and Kai learn to reconstruct the other elements of the activity system as well. This would mean using not only annual tools such as weed flaming but also organic means of managing the whole field system. The community (Fig. 2) of the farm, consisting of the people sharing the same object, can be considered as an enterprise, or as a community of farmers. This also reflects
Instruments:
Annual tools vs. long-term management of the field system

Subject: Maria and Kai

Object: Short-term and intensive use of resources vs. ecological and sustained use of resources

Rules in marketing and economics vs. rules for organic farming

Community: Enterprise vs. extended community of farmers

Division of labor: Independence vs. cooperation

Fig. 2. The activity system of the Kola farm and its contradictions.

Instruments:
Old means of communication vs. New entrepreneurial means of communication and planning

Subject: Eeva and Antti

Object: Independence and self-sufficiency vs. entrepreneurial integration into the society

Rules: Peasant ethics vs. Rules of business-life

Community: Farm and village vs. Marketing company

Division of labor: Done on the farm vs. tasks distributed among farmers

Fig. 3. The activity system of the Alanen farm and its contradictions.

different ways of organising the division of labour. On the Kola farm, the familiar rules of marketing and economy now compete with the relatively new rules of organic farming. The point is to manage the change going on simultaneously in many elements. The technical challenge of natural resource use is also a social challenge.

On the Alanen farm (Fig. 3), the old form of activity was practised in a relatively closed farm and village community. The last 5 years have seen many changes: Eeva works outside the farm; hired labourers, even from abroad, work on the farm; the marketing company functions province-wide. In 1999, the Alanens rented new fields in another municipality. In short, the farm activity has steadily expanded, and interacts increasingly with a more diverse set of off-farm actors.
However, the old, more closed form of activity still prevails on the farm, causing difficulties in new organizational and marketing tasks and communication. The new form of activity, with complicated tasks and with workers from outside the local community, requires new organization and division of labor.

6. Envisioning a new form of farming activity: forming the zone of proximal development

Figs. 2 and 3 show in a simplified form the contradictions and learning challenges that the Kola and the Alanen farms face in their new farming activities. In practice, the farmers do not simply ‘adopt’ new given organic techniques, or a new entrepreneurial work management. When they do it, they do it in their own ways, typically mixed with steps back towards the old way of farming. On the other hand, they may embark on solving the existing contradictions in a qualitatively and historically new way. Here we come to the area in which the methodology of developmental work research is especially strong, and for which the model of an activity system (Fig. 1) was developed. Seeing and understanding concrete disturbances in the farmers’ actions as part of the development of the collective farming activity with its contradictions may help farmers to “...focus their energy onto the crucial task of resolving those contradictions by means of expanding the object and reorganising the activity accordingly, instead of being victimised by changes that roll over them as if forces of a natural catastrophe” (Engeström, 1999).

Because complex farming systems do not develop in linear fashion, it is necessary to envision a zone of possible directions which the farming activity is facing. To depict this, a model of the zone of proximal development of organic farming (ZoPD) was devised (Fig. 4).

The ZoPD model makes explicit two developmental challenges in organic vegetable farming—moving towards more societal integration and towards more ecological

![Diagram](image_url)

Fig. 4. The zone of proximal development of organic vegetable farming, based on the Kola and the Alanen farms.
use of resources. It shows two directions for development, which are crucially present on the Kola and Alanen farms. These directions are also present in the historical development of organic farming and Finnish agriculture. Roughly, the Kola farm can be placed in the C quarter, and the Alanen farm in the B quarter of the ZoPD model (Seppänen, 2000). The Kola farm represents organic vegetable farming with a historical path from horticulture, and the Alanen farm organic vegetable farming with a historical path from conventional Finnish agriculture. As the ZoPD model is derived from the two core contradictions of these two different farms, it could help, as a learning tool, not only the Kola and the Alanen farmers, but other organic vegetable farmers as well.

In Fig. 4, none of the directions is self-evidently right or wrong. There is no wise teacher pointing out the best way to go. Therefore, the four directions of the model remain open. Indeed, farmers make various kinds of decisions and experiments in the zone of proximal development. In practice, the multiplicity of directions is also reflected in the quality and price of the products in the markets.

Modeling the ZoPD is not enough, however. It is also necessary to develop concrete actions that will take the activity in a direction desired by the farmers. The Kola and the Alanen farmers made many experiments during the study. The following section describes what were, according to my interpretation, the concrete actions needed for the progress of the transformation of the two farms’ activities, and how these issues were dealt with in my interaction with the farmers.

7. Strategic actions and possible solutions

In the learning process, it is necessary to focus the attention of farmers and the R&D workers on selected strategic actions, needed to transform the activity. This section gives examples of new conceptual tools that were used with the farmers for the identification of the strategic actions. These 'intermediate tools' are important in showing linkages between the activity-level contradictions and visions and action-level disturbances.

7.1. The Kola farm

The key part of the developmental challenge of the Kola farm was learning the long-term management of the field system. Besides the couch grass disturbance shown in Section 3, the challenge is also seen in improving soil structure, in order to raise the yield levels and quality.

One of the problems experienced by the Kolas was that customer demand exceeded their supply. The Kolas sold most of their yield in bundles and not kilograms. Therefore they calculated their products in cash and were not aware of their yield levels. The researcher’s analysis showed to Maria and Kai that their yield levels were quite modest. The model in Fig. 5 suggested three possible strategies for increasing their product volume.
To increase the yield per hectare

The volume of the products does not satisfy the demand

To increase the acreage in vegetable production

To cooperate with other farmers in marketing

Fig. 5. Strategies for increasing product volume.

The farmers could increase the volume of the products by increasing their acreage, or they could try to increase the yield levels per acreage. A third option would be to co-operate with other farmers in order to satisfy customers' increased demands. Fig. 5 elucidated the different options given to the Kolas for discussion. As the Kolas had already rented new fields, and were also starting co-operative marketing with another farming family, they chose to try to raise their yield levels per hectare.

The yield level is of course important for the economics of the farm, but it is also an indicator of the fields' ecological production capacity. Whilst marketing comes naturally to the Kolas, getting the best use out of natural resources is more of a challenge. Therefore, increasing yields per hectare is a potential lesson in long-term farming system practices, such as green manuring. Devising a new crop rotation plan for the Kola farm, done in collaboration with the Kolas, an advisor and myself, constituted one step toward forming a new pattern of activity. Consequently, the strategic actions of the Kolas are found in the implementation of the new crop rotation plan.

7.2. The Alanens

One of the problems facing the Alanens related to the use of hired labour. The model in Fig. 6 helped the Alanens analyze the problem. The model emerged from my general observations of organic vegetable farmers (Seppänen et al., 2000), where there are three main orientations towards workers:

1. workers treated as a production input with an emphasis on work efficiency and quality;
2. workers treated as part of the farming community, needing collective care-taking; and
3. workers as objects of instruction, emphasising teaching them organic cultivation techniques or principles, agricultural tasks, or rural lifestyle in general.
Antti and Eeva Alanen placed themselves, in terms of their own orientation, in the scheme (Fig. 6). Their marks are within the darker patch—far away from the ‘collective care-taking’ of the workers. According to our analysis, strategic actions for the Alanen farmers’ learning would be found in the use of hired labour.

We discussed the issue of workers again in January 1999. My suggestion was that preparing explicit written rules for the workers might be helpful. We decided to develop such rules right away. Besides time schedules, lunch breaks and wages, the rules dealt with accommodation and feeding the workers.

Had Antti given the written rules to the workers? During the spring planting time he told me that, while having expanded them a bit, he had not yet given them, as he was not yet quite happy with them. He wanted the rules to be as comprehensive as possible to avoid changing them later.

In July 1999, the question of workers became again acute. In our discussion, the model of three orientations towards farm workers (Fig. 6) showed the inconsistency of where the Alanens had placed themselves (the dark patch in the scheme) but how they actually behaved in practice (the upper corner of the scheme). Antti admitted the existence of a contradiction between the ‘collective care-taking’ and ‘production input’ orientations vis-à-vis the workers. Although his rules for the workers were not finalised and shared, he said thinking about them had already helped him in his supervision of work. Compared with the analytical learning tools in Figs. 5 and 6, the written rules for workers were an implementation tool, aimed at establishing a more clearly defined work organization and division of labour.

8. Discussion

8.1. Lessons learned from the case studies

It has been suggested that the difficulty of identifying problems is one factor in the poor success of R&D projects (Mascaretti, 1994). In this study, the problems were
identified both at the level of actions (disturbances) and activity (contradictions). Disturbances were found by observations and interviews on the farms. This study shows that developmental work research offers theoretical tools for problem definition in R&D projects. Rather than linear projections into the future, the methodology enables us to form historically grounded ones with multiple alternative directions of development for a particular activity system. These directions are non-deterministic, open to negotiation among different stakeholders.

In other developmental work research projects, videotaping disturbances has been a successful learning tool (Engeström, 1999). In this study, disturbances were discussed with the farmers with the help of my field notes and stories (see Table 1, third column, first step). The analysis of the historical development of the activity and the model of an activity system (Fig. 1) made it possible to explain the occurrence of disturbances as manifestations of contradictions at the level of activity (Figs. 2 and 3). In the learning process, it is crucial to show and discuss the link between particular events and experiences of the farmers and the directions and visions of the whole activity. Therefore, intermediate, locally sensitive tools (Figs. 5 and 6) were used to connect the actions in the use of natural resources and the use of hired labour to the level of farming activity with its contradictions.

Farms with divergent histories were deliberately selected for this study. They have different developmental contradictions, and consequently, different tools will be required to promote farmers' expansive learning. This study suggests that, rather than trying to find and use universal analytical models, R&D workers need to learn to create and modify locally suitable and efficient tools of learning for farmers.

The disturbances, contradictions, new forms of activity and solutions for both farms are summarized in Fig. 7. On the Alanen farm, a new type of activity is yet to be formed. Therefore, the potential new form of activity, the new work organization, is in parentheses with a question mark. However, as mentioned, hired labour rules were discussed as a solution. On the Kola farm, the new pattern of activity was

<table>
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<tr>
<th>Activity: systemic and structural</th>
<th>Problems</th>
<th>Outcomes</th>
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Fig. 7. Summary of the developmental challenges and their possible outcomes of the farms.
formed with a new crop rotation plan. How the new crop rotation was implemented is still to be analyzed.

8.2. Generalization of the findings

The methodology of developmental work research focuses on change processes of work activities. Therefore, the main interest is not in the features of an activity or enterprise that are standard practice at the moment, but rather in the newly emerging aspects of an activity that might become general later (Engeström, 1988). This, together with the analysis of the systemic elements and relations of the activity and its history, enables R&D workers and practitioners to form a model for forging of the next step, or the zone of proximal development, of the activity system.

How might the tools presented in this paper be used and generalized in further studies? The first step would be to use the ZoPD model (Fig. 4) to analyze different types of organic vegetable farms and their problems. Second, the model of the activity system (Fig. 1) would be used to analyze the past and present farming activity of the participating farms and to reveal contradictions in them. From there, the intervention would proceed to helping the farmers find their own strategic actions and developmental projects for change. Intermediate tools, such as those in Figs. 5 and 6, could be used in this facilitation, or new ones could be created. In this way, the idea of the learning tools presented in this paper is not to implement a fixed uniform new pattern of activity to all farms. Rather, the idea is to facilitate farmers in analyzing their local and unique situations and to help them go forward with their change efforts.

If the contradictions expressed in the ZoPD model are common to organic vegetable farming, and if the models are introduced satisfactorily in developmental interventions, they can lead to changes in the farmers' practices, such as new entrepreneurial rules in work organization, or new instruments for the management of natural resources. The tools and methods developed may spread in practice among farmers and R&D workers, offering potential for emerging new forms of activity on other farms and regions. In this way, it is possible for the R&D workers to enhance the creation and spread of new forms of farming activity. Thus, generalization within the framework of developmental work research is a practical, material process of creative transfer and escalating implementation of new tools.

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Organic farming has rapidly evolved from a farmers’ movement to an institutional part of agriculture. In order to understand this dynamic transition, this study examines farm practices in the development of organic vegetable farming. The concept of learning is used to describe how change is dealt with.

- What are the learning challenges in organic vegetable farming?
- What do these learning challenges suggest about its zone of proximal development?
- What kind of tools can be developed to deal with these learning challenges?

Learning in this study consists of actions or practices that can be interpreted as moving towards both the ecological and sustained use of natural resources, and societal and entrepreneurial integration. This book offers insightful perspectives for anybody interested in the development and practices of organic farming, learning challenges and tools, and the societal linkages of the use of natural resources.