

# Learning Challenges in Organic Vegetable Farming

An Activity Theoretical Study  
of On-Farm Practices

Laura Seppänen

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Supervisors: Prof. Yrjö Engeström  
Center for Activity Theory and Developmental Work Research  
University of Helsinki, Finland

Prof. Juha Helenius  
Department of Applied Biology  
University of Helsinki, Finland

Reviewers: Prof. Marianne Cerf  
Research Department Agrarian Systems and Development  
National Institute of Agricultural Research, France

Prof. Reijo Miettinen  
Center for Activity and Developmental Work Research  
University of Helsinki, Finland

Opponents: Prof. Cathrine Hasse  
Department of Educational Psychology  
Danish University of Education, Denmark

Prof. Edvin Østergaard  
Department of Mathematical Sciences and Technology  
Agricultural University of Norway

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Institute for Rural Research and Training

Seinäjäki  
Kampusranta 9  
FIN-60320 SEINÄJOKI  
Tel. +358-6-4213 300  
Fax. +358-6-4213 301

Mikkeli  
Lönrotinkatu 3-5  
FIN-50100 MIKKELI  
Tel. +358-15-20231  
Fax. +358-15-2023 300

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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:

I Seppänen, L. 2000. Activity theoretical view on crop rotation planning in organic vegetable farming. Fourth European Symposium on European Farming and Rural Systems Research and Extension, in Volos, Greece, April 3 to 7, 2000. Proceedings: 283-292.

II Seppänen, L. 2002. Societal integration in organic vegetable farming: exploring the learning challenges. *The Journal of Agricultural Education and Extension*, 8 (2): 87-100.

III Seppänen, L. and Koskimies, H. 2002. Farming across the years: temporal and spatial dimensions in learning organic farming. IFSA European Symposium on Farming and Rural Systems Research and Extension: Local Identities and Globalisation. Florence, Italy, April 8 to 11, 2002. Proceedings: 528-537.

IV Engeström, Y., Puonti, A. and Seppänen, L. 2003. Spatial and temporal expansion of the object as a challenge for reorganizing work. In: Nicolini, D., Gherardi, S. and Yanow, D. (Eds.). *Knowing in organizations: A practice based approach*. Armonk: M. E. Sharpe: 151-186.

V Seppänen, L. and Helenius, J. 2004. Do inspection practices in organic agriculture serve organic values? A case study from Finland. Will be published in *Agriculture and Human Values* 21 (1): 1-13.

VI Seppänen, L. 2002. Creating tools for farmers' learning: an application of developmental work research. *Agricultural Systems* 73 (1): 129-145.

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,<sup>1</sup> 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

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<sup>1</sup> 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 harms, 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<sup>2</sup> 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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<sup>2</sup> 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, Mietinen 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.<sup>3</sup> 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.

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<sup>3</sup> 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.<sup>4</sup> 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.

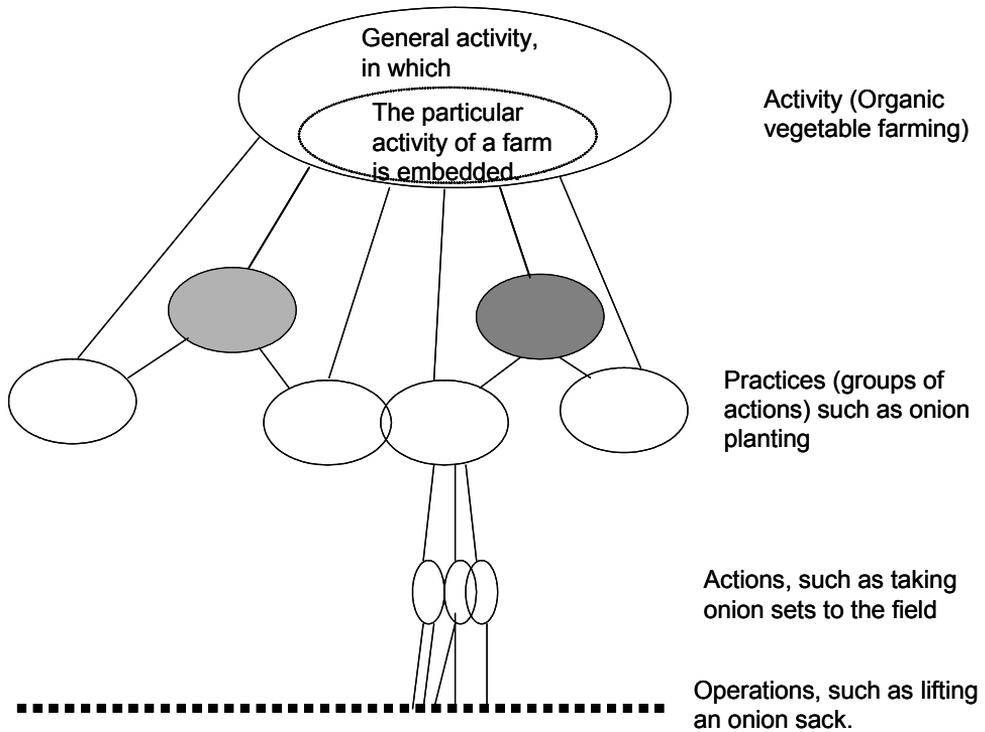
The tools, or instruments, of an activity give a societal meaning and structure to individual perception and experience (R. Engeström, 1999; 328). Sometimes the activity requires that tools be taken as objects for some time, and objects may become tools.

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'enkov 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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<sup>4</sup> 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,<sup>5</sup> 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

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<sup>5</sup> 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 mixture 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 2.3.

## **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.

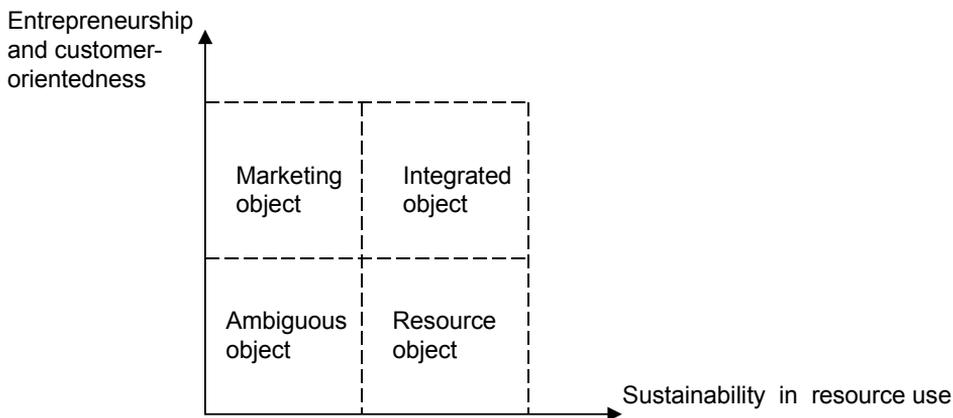
In the introduction to their book, Long and van der Ploeg (1994) clearly suggest the importance of considering and analyzing endogenous development. In ‘canonical scientific approaches’ it is difficult to understand the empirically-relevant practices of endogenous development theoretically (Benvenuti, 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 shows 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<sup>6</sup> and the development of organic agriculture in Finland.<sup>7</sup> 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).

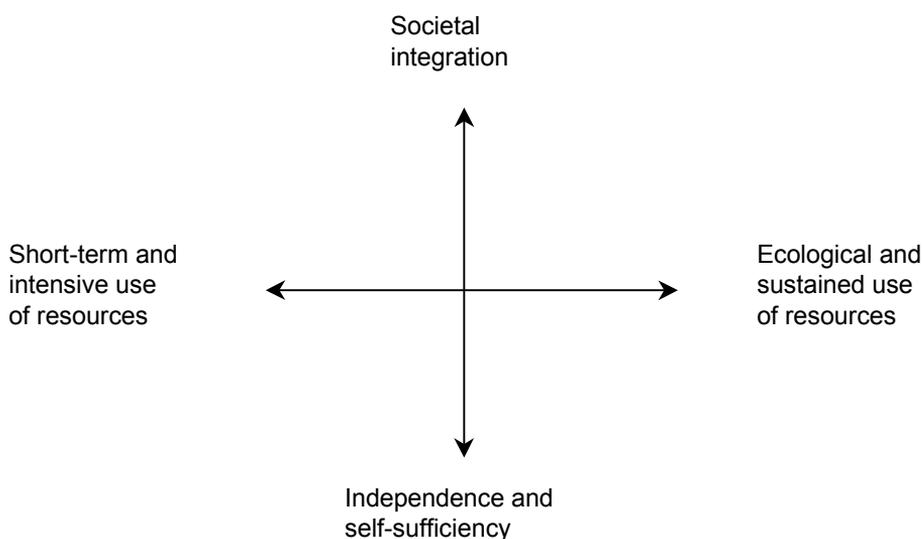
The framework is not only based on histories. Farms involved in the study are figured as activity systems where "in practice, the farmers do not simply 'adopt' new given organic

<sup>6</sup> 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 price fluctuations. I draw on a history of Finnish agriculture by Katajamäki and Kaikkonen (1991; 46-47) 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).

<sup>7</sup> 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).

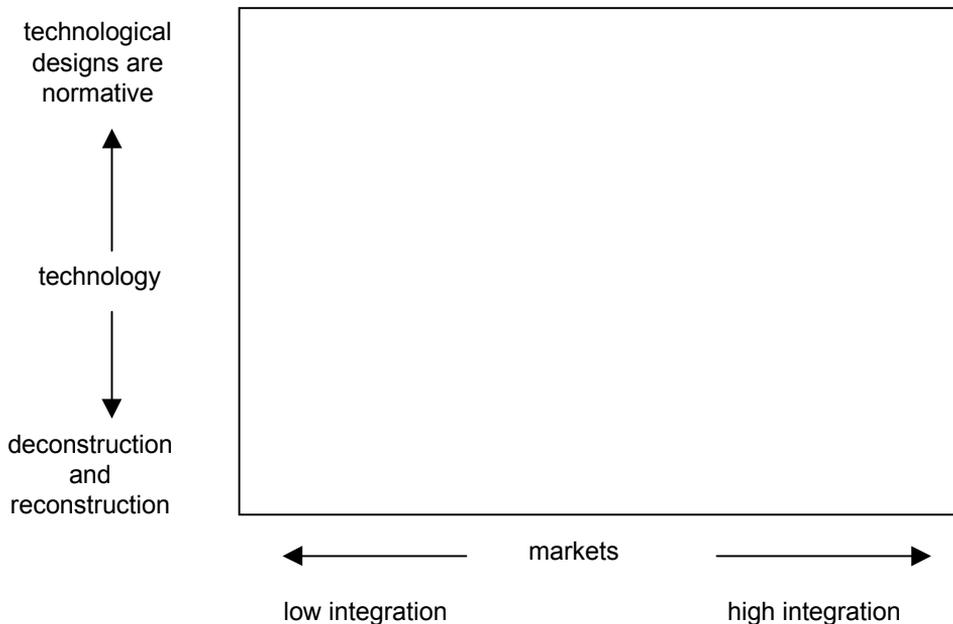
As we can see from Figures 2 and 3, the focus has shifted from entrepreneurial integration to societal integration in general. Roughly speaking, the nature of the use of natural resources dimension was contradictory on the Kola farm, as was the dimension of entrepreneurial integration into society on 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).

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 craftsmanship 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.<sup>8</sup> The challenge for organic farmers is neither of these. I will come back to this in Section 2.3.

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

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<sup>8</sup> 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.<sup>9</sup> 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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<sup>9</sup> 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).

rotational turns:	1998	1999	2000	2001	2002
1.	vegetables	vegetables	annual green manure	vegetables	perennial green manure
2.	annual green manure	vegetables	perennial green manure	perennial green manure	vegetables
3.	perennial green manure	vegetables	vegetables	annual green manure	vegetables
4.	vegetables	perennial green manure	perennial green manure	vegetables	vegetables
5.	vegetables	annual green manure	vegetables	perennial green manure	perennial green manure
6.	perennial green manure	perennial green manure	vegetables	annual green manure	vegetables

**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

(Aarts and van Woerkum, 1999; 36). 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<sup>10</sup> 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<sup>11</sup> 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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<sup>10</sup> 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).

<sup>11</sup> 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.

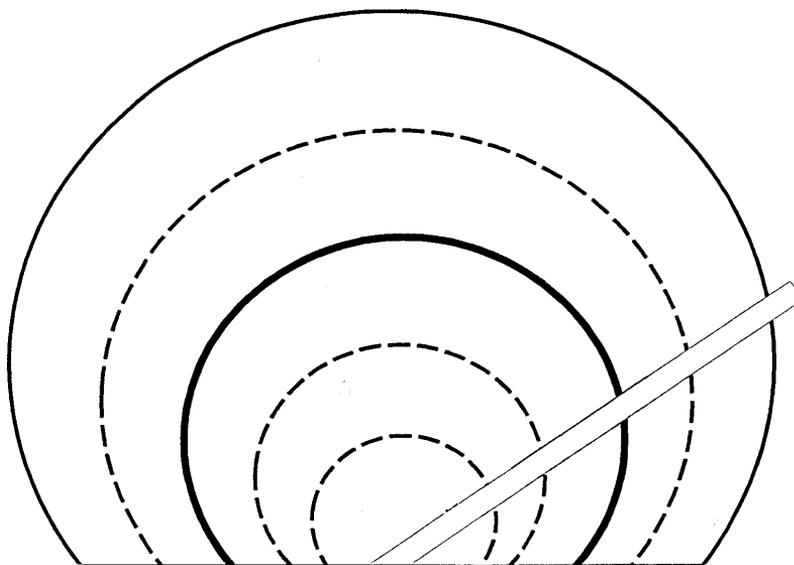
In all these relations, the challenge for organic vegetable farming means crossing multiple cultural boundaries. I see creating possibilities for mutual information exchange and common negotiation as directly as possible as an opportunity to go forward with these challenges. This happens simply by people 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.

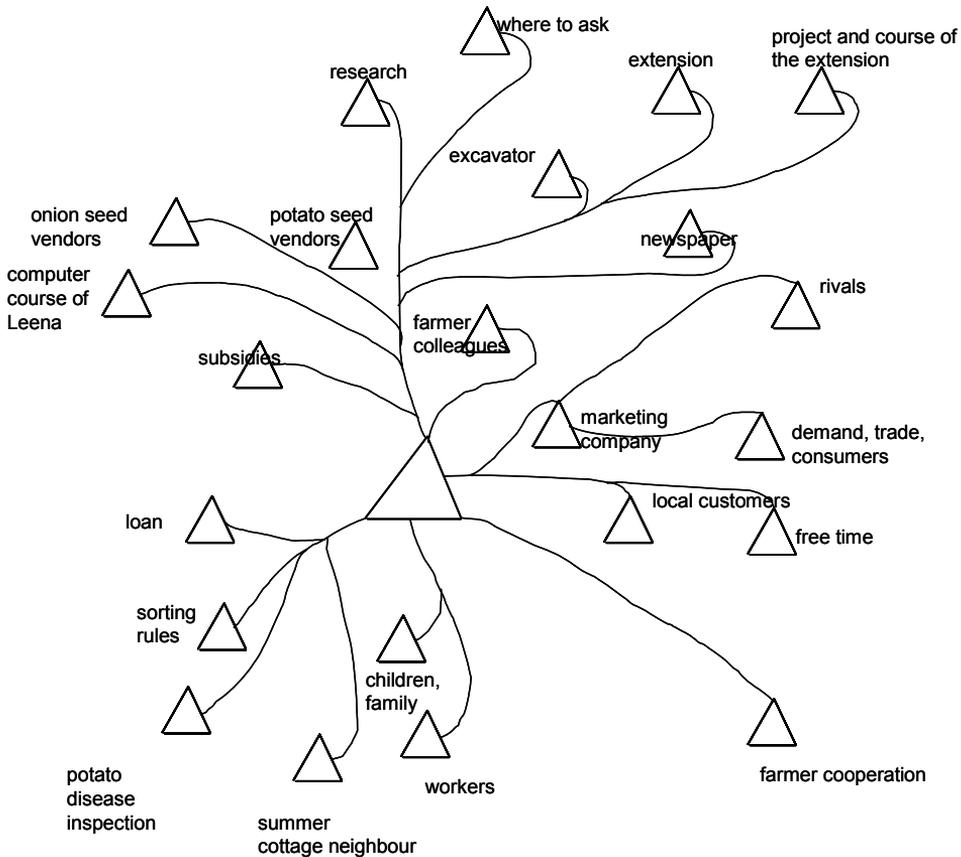
Levels 1 and 4 correspond to a society orientation that typically characterizes European development in history, while levels 2 and 3 correspond to community orientation (Bohler and Hildenbrandt, 1990; 19). The authors show how different levels (1-4) predominate in different families. Mikko Kumpulainen's (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 categories<sup>12</sup>. 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.

<sup>12</sup> In fact the Bohler and Hildenbrandt's (1990) analysis interpreted actions of individuals as showing performances at other levels.



**Figure 8.** *The Alanen farm contact network.*<sup>13</sup>

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

<sup>13</sup> 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.

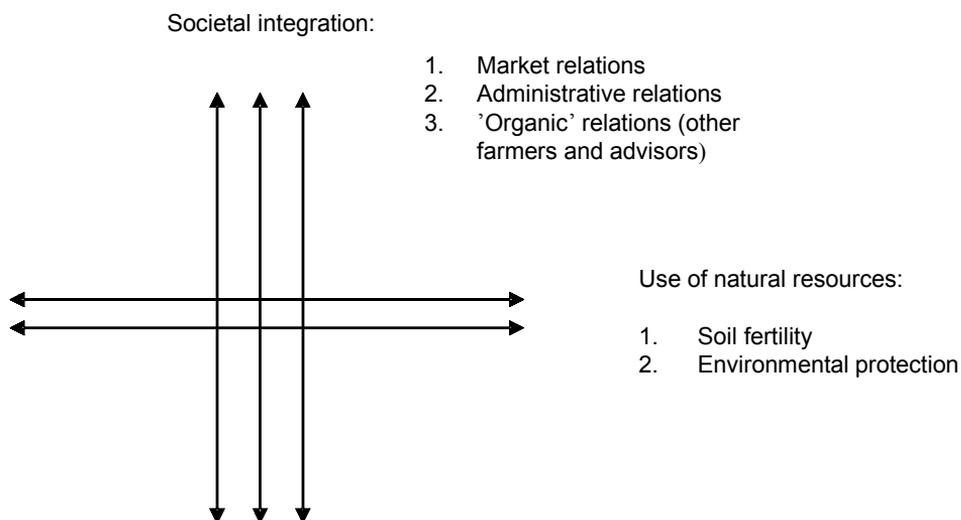
Many of the links in Figure 8 are indispensable, or at least improve the performance of organic vegetable farming. If the realities of the farms have dependencies, how then should we understand the “independence and self-sufficiency” side of the societal dimension (Figure 3, Section 2.1)? It is to be 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 bio-social-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.

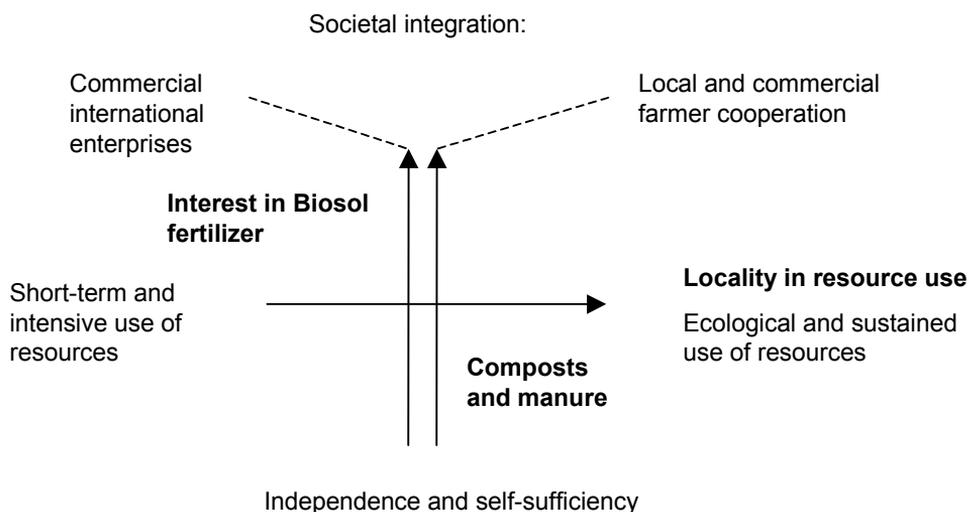
The ‘context which surrounds’ metaphor can be visualized as a box within boxes or, as in Kumpulainen’s Figure 7 (Section 2.3), a circle within circles. As I understand it, it does not clarify the movement from level to level or the quality of the relationship: only telling us what the ‘bigger’ or ‘broader’ 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).



**Figure 9.** Historical layers and categories of the dimensions of the framework (Figure 3).

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.

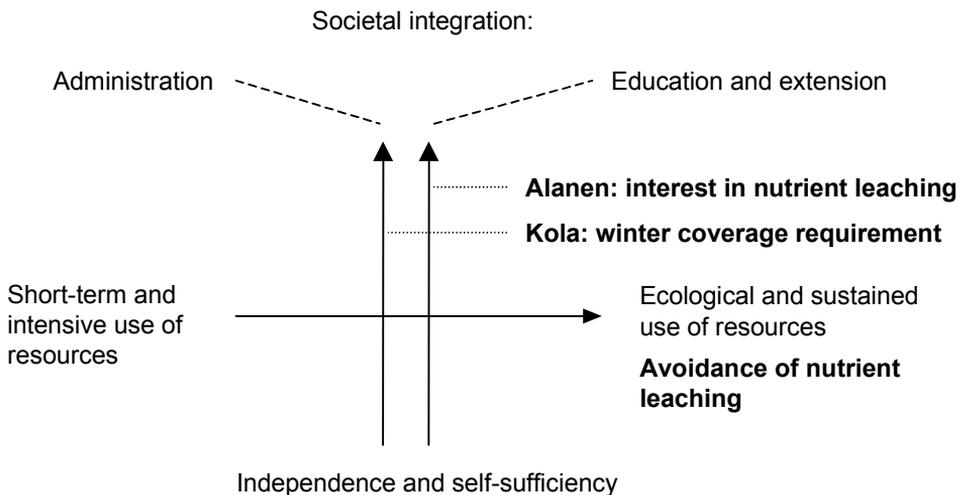


**Figure 10.** Choices of additional fertilizers of the Kola farm interpreted in the framework of the study.

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.<sup>14</sup> 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-advisor 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 Waldenström, 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.

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<sup>14</sup> Although it was not clearly stated in their article, Ison et al. (2000) may agree on this.

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.<sup>15</sup> In the two latter cases, the framework (Figure 10) would need to be changed.

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<sup>15</sup> 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.

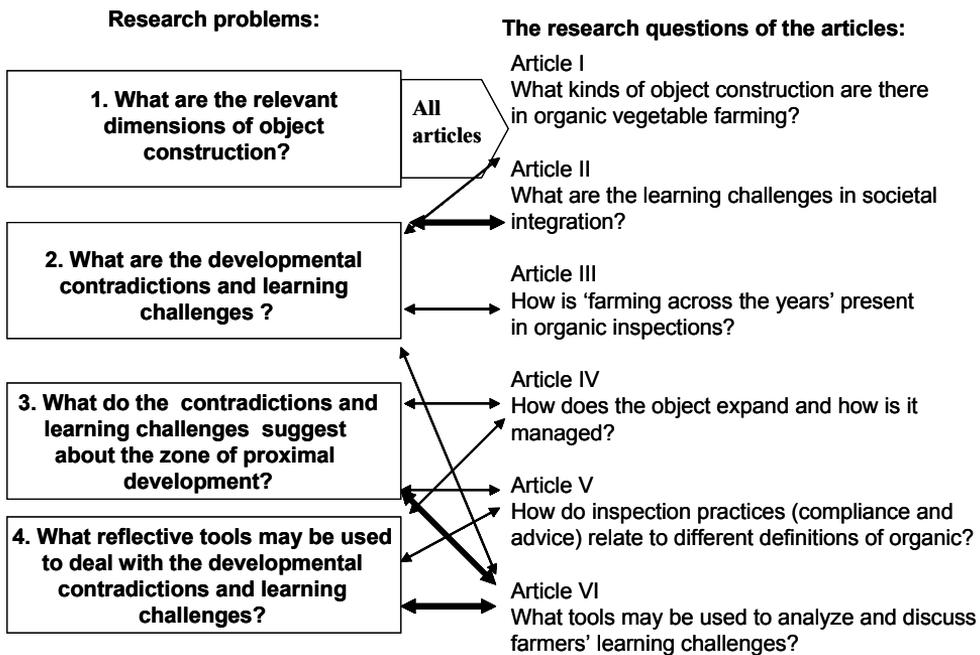
#### *3. What do the contradictions and learning challenges suggest about the zone of proximal development of organic vegetable farming?*

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.



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

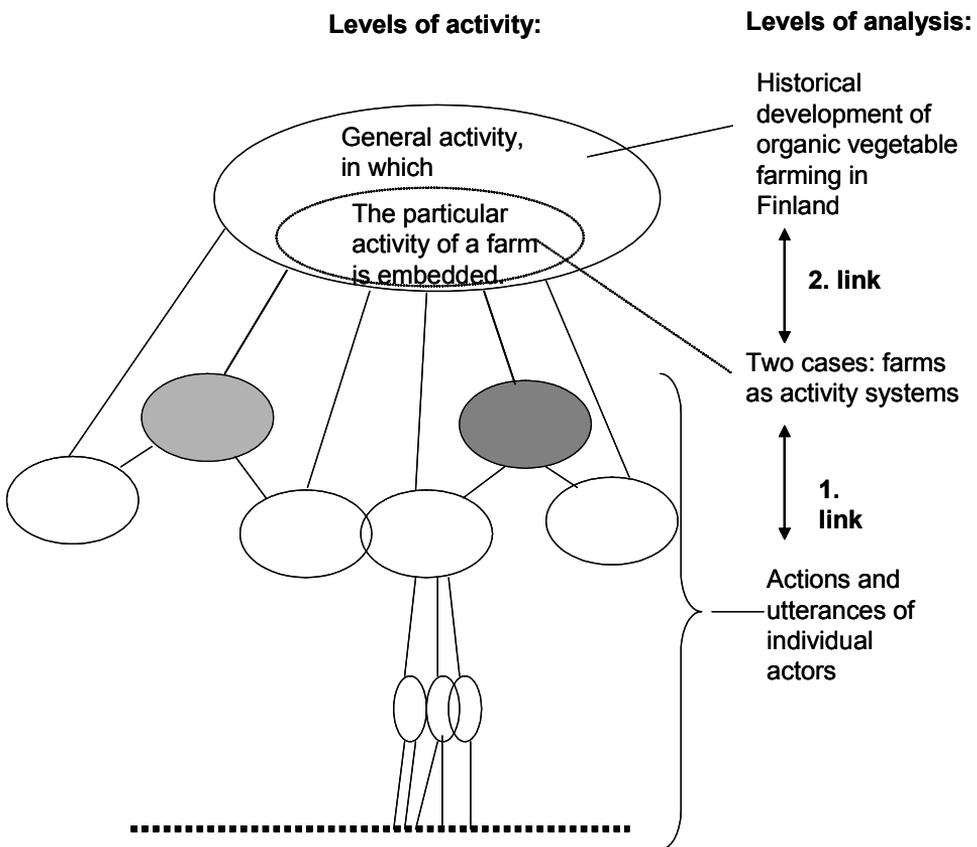
Research problems relate to many research questions in the articles, but not all. All articles (I-VI) contribute to the first research problem by explicating the dimensions in object construction in different ways. The problem of learning challenges is particularly important in article II, while articles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

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.

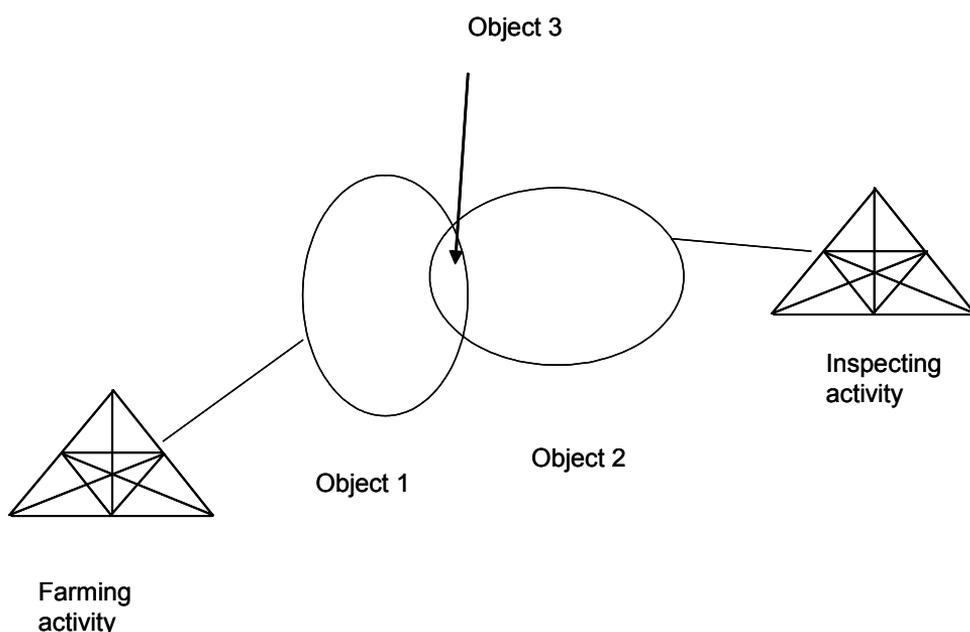
The basis for the ethnographic study was the documents and reports produced during the previous project (Participatory development of organic vegetable farms; see Seppänen, et al., 2000). My fieldwork for the present study consisted of more than ten visits per year and various telephone calls to both 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’<sup>16</sup> 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.

**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.

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

<sup>16</sup> 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.<sup>17</sup> 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.

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<sup>17</sup> 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.<sup>18</sup> 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.

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<sup>18</sup> 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.*

<b>Name of the practice</b>	<b>Farm</b>	<b>The contradiction<sup>19</sup> of the farm that the practice can potentially solve</b>
Rye as a catch crop	Kola	Enhances nutrient recycling in the field without diminishing the acreage of vegetables sold to customers (I, Figure 2, arrow 4)
Rye as an alternative crop	Alanen	Saves work load and soil fertility (compared to vegetables) and still produces goods for sale (compared to green manure) (I, Figure 3, arrow 4)
Buying potato from another region for local demand	Alanen	Possibility to satisfy the customer needs without intensifying the farm production (I, Figure 3, arrow 8)
Farmer cooperation	Kola	Opportunity to satisfy the demand that exceeds the farm production; overcoming the horticulture-agriculture boundary (I, Figure 2 arrow 3; II, page 95)
New crop rotation plan + implementation	Kola	Maintaining soil fertility while producing enough vegetables (VI, Figure 7, page 142)
Rules for hired workers	Alanen	Moving from community-based work of the farmer family towards organized work with hired labor from outside (VI, Figure 7, page 142)
Speech across the years	Kola	Short-term production vs. long-term field management (III, page 531; IV, page 182)
Creating social relations with administration	Kola	Regulations as restricting the production vs. regulations as means of managing production (IV, page 172)

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.

<sup>19</sup> 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.<sup>20</sup>

*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

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<sup>20</sup> 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 were 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.<sup>21</sup> 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;<sup>22</sup> 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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<sup>21</sup> It would be interesting to research the use of the framework.

<sup>22</sup> 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; Juntti, 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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