A Polyocular Framework for Research on Multifunctional Farming and Rural Development

Egon Noe*, Hugo Fjelsted Alrøe and Anne Mette S. Langvad

Abstract

The paradox of multifunctionality is that, on the one hand, the specialised functionalities of agriculture arise only because of the functional differentiation of social systems and scientific disciplines and, on the other hand, multifunctionality can enter only as a way to mediate between conflicts, interests and fragmented knowledge when different functions and observations of functions combine. The aim of this article is to contribute to a theoretical and methodological platform for multidisciplinary research on multifunctional farming. With the notions of polyocular cognition and polyocular communication we introduce a second order, interdisciplinary communication process that can meet the challenge of creating a shared view on multifunctional farming. Polyocular communication must be based on rules other than the rules of the disciplines involved. Whereas disciplinary communication is about providing consistent, efficient and precise knowledge in the context of a sharply delimited research world, polyocular communication is about extending a multidimensional space of understanding.

Introduction

The aim of this article is to contribute to a theoretical and methodological platform for multidisciplinary research on multifunctional farming. This aim is rooted in a widely shared understanding that the future sustainable development of agriculture not only is a matter of developing multifunctional solutions offered by the different perspectives involved in sustainable development, but also involves multidisciplinary knowledge (Huylenbroeck and Durand 2003). This understanding is also expressed in the many national and European calls for cross-disciplinary and multidisciplinary projects (for example, Micro-economic instruments for impact assessment of multifunctional agriculture to implement the *Model of European Agriculture*, MEA-Scope; Capitalisation of results on the multifunctionality of agriculture and rural areas, MULTAGRI).

Published by Blackwell Publishing, 9600 Garsington Road, Oxford OX4 2DQ, UK
Sociologia Ruralis, Vol 48, Number 1, January 2008 ISSN 0038–0199

On the face of it, both the notions of multifunctionality and multidisciplinarity seem obvious and easy to apply. However, our experience from our own involvement in multidisciplinary teams and from working with the subject of multifunctionality indicates that it is difficult to obtain both a common understanding of the research object in multidisciplinary research and a common understanding of the notion of multifunctionality. This article builds on three fundamental insights gained from our experiences:

- Multifunctionality inherently involves a plurality of perspectives. No single discipline can fully incorporate all these different perspectives and therefore research on multifunctional agriculture has to be multidisciplinary.
- Multidisciplinarity is not trivial. The challenges and problems of multidisciplinarity are deeply rooted in the differentiation of disciplines that operate in different codes, delimitations, times and scales. This differentiation destroys the options for bringing the observations together within the same formula, and multidisciplinary research therefore needs a framework for handling different disciplinary perspectives.
- The problems of operationalising the notion of multifunctionality are rooted in the same substantial and fundamental philosophical problematic of communication and co-operation in multidisciplinary teams, but with the added complexity that the perspectives of disciplines here must meet the perspectives that are already inherent in the research object, multifunctional farming. The result is that different disciplines operate with different definitions and delimitations of multifunctionality, and this makes it even more difficult to communicate on multifunctional farming.

In this article we try to understand why multidisciplinary research on multifunctional farming is such a difficult task, outline a semiotic theoretical basis for this understanding and present what we have called a polyocular framework for multidisciplinary research on multifunctional farming. Before we turn to the theoretical understanding and the related framework, we offer reflections on the notion of multifunctionality.

The notion of multifunctionality

From a contemporary perspective, all farms were multifunctional in their organisation a century ago. This was not for ideological reasons but because of the purposefulness of multidimensionality. Because at that time most people were farmers and the farm was the limit of their mental universe, multifunctionality was simply a non-conceptualised agricultural practice. Like the rest of society, agriculture has since then undergone functional differentiation into subsystems that operate from function-specific perspectives as a means to increased efficiency (Kneer and Nassehi 1997, p. 136). In the European context these differentiation and specialisation processes have been strongly supported by postwar policies (Moreira 2004).

One may claim that the differentiation processes have been very successful in terms of efficiently pursuing the goals of the differentiated perspectives, since the functional differentiation of society has greatly intensified (Luhmann 1995, p. 476). In recent decades we have seen an even stronger specialisation into oligo-functional farms, the major rationale and driving forces now being the changing production

conditions in terms of technological and organisational developments and the globalisation of markets. Agricultural specialisation has led to such a tremendous increase in productivity that, until the 1970s, it was commonly perceived as a success story (although there were rising critiques of it in the 1960s). After that, the political importance of productivity gradually decreased and other farm produced benefits gained focus and became demanded by society.

During the 1970s the debate mainly focused on the environmental aspects of modern industrialised agriculture. From then on, the many unintended (and invisible, from dominant perspectives,) side effects of farming on the environment, landscapes and the options for making a livelihood in rural areas led to a focus on the viability of smaller farms, employment in connection with local diversified production and rural social life on a whole, and with the Brundtland report in 1987 this crises of agricultural development was generally framed as a sustainability debate.

In the 1990s the notion of 'multifunctionality' gained increasing importance as a way to operationalise sustainable development, and a way to reintroduce a range of different perspectives into the development of agriculture, including both the pre-productivity perspectives and the new perspectives introduced by the sustainability discourse (Wilson 2007).

Farm-based rural development covers many aspects related to the character of the farm and its contribution to the local area (Marsden 2003). From a farming perspective, this may be farm activities that result in more value added per unit of product, the diversification of activities to include new non-agricultural activities such as agro-tourism, nature and landscape management and household resource mobilisation through measures such as farming economically or off-farm incomes (Ploeg and Renting 2004). The potential of farm-based rural development for raising the income level on farms as well as in the wider rural economy has been demonstrated (Ploeg and Renting 2000, 2004; Gorman *et al.* 2001; Ventura and Milone 2000; Roest and Menghi, 2000; Knickel 2001; Knickel *et al.* 2004; Mielgo *et al.* 2001).

It is in this context that the term, multifunctionality, gains meaning as a tool for focusing not only on the negative side effects of farming, which are emphasised in the sustainability debate, but also on the positive effects that we want farming to have for the rural areas (OECD 2001).

Although policies such as the Common Agricultural Policy (CAP) have contributed to the development into specialised and more effective oligo-perspectives, our claim is that the crisis of agriculture is not only rooted in failed policies, but in the much deeper co-development of various differentiation processes in science, market, technology and so on (Norgaard 1994). Policy is important, but if the problem is seen as only a policy problem, we will fail to address the real underlying processes. This article suggests how we, within science,[1] can handle such fundamental social processes of differentiation of perspectives.

The problems and challenges of the plurality of perspectives

Various approaches have been developed to reintegrate perspectives, such as systems theory, modelling, learning theory and cross-disciplinary research in various forms. Often the search for a comprehensive approach has led to an unfruitful opposition

between 'reductionist' and 'holistic' science. From the holist point of view, reductive methods are bad science because they do not capture the connectedness of complex reality, and from the reductionist point of view, reductive methods ensure the quality of science and other methods are, therefore, not scientific (Alrøe 2000; Alrøe and Kristensen 2002).

Our claim is that none of these integrative approaches have really managed to solve the basic problems arising from differentiation into function-specific perspectives. Either they ignore these fundamental problems of reintegrating perspectives or they just introduce a new (so-called holistic) perspective that neglects the others. Some of these problems may best be illustrated by cases based on projects that we have been involved in.

The first case is a multidisciplinary research project on the quality of nature in relation to organic farming.[2] Four disciplines, and thereby four perspectives, were involved: one focusing on soil fauna, one on the flora of small biotopes, a geographical perspective on landscape and a sociological perspective on the perceptions of farmers and farm families of landscape and the values of nature. At first glance this looks like a perfect multidisciplinary project and the researchers involved were all keen to work together. A series of cross-cutting multidisciplinary events were organised to improve the multidisciplinary outcome of the project. We also agreed to work in the same locations (study areas). Twice a year, a two-day workshop was organised, and part of this workshop included a visit to one of the study areas. Although this was an interesting project and generated much insight, in our opinion it never succeeded in integrating the insights from individual disciplines into a multidisciplinary understanding, apart from challenging and stimulating the individual disciplines. According to our analysis, at least two main barriers to a deeper integration in this project emerged. The first was that we were not observing the same object. To agree on a shared study area is not the same as to agree on the same object. In this project there was no shared platform to interlink the different objects studied from the different perspectives: the micro-organisms in the soil, biodiversity in small biotopes, the management of the farm and the social dimension of organic farming. Secondly, the objects were not observed from the same understanding of the quality of nature. Each approach operated from its own more or less explicitly embedded theoretical and philosophical understanding of quality of nature, which made communication across perspectives complicated (Tybirk *et al.* 2004; Noe *et al.* 2005; Hansen *et al.* 2006).

We do not think this was a trivial problem caused by especially stubborn researchers; on the contrary, most researchers showed a co-operative spirit right from the beginning. It was a more fundamental problem linked with the core nature of disciplinary differentiation into different perspectives, which implies a perspective-based definition and demarcation of the object.

The second case that we draw on here is a large EU project on multifunctional farming, Micro-economic instruments for impact assessment of multifunctional agriculture to implement the Model of European Agriculture (MEA-Scope 2007). In our view, this case illustrates the classical solutions to the above problems of reintegrating perspectives.

In MEA-Scope, three different disciplines were mainly involved, agronomy, economics and sociology, each with their own approach to multifunctionality. The project

aim was 'to develop an integrated framework for the assessment of the multifunctionality impacts of CAP reform options'. The key rationale of the project was to integrate three different modelling tools, an agronomic tool at the farm level, a farm-based economical tool and a region-based economical tool, which in combination could simulate the effect of different policy measures.

The project was born with two good intentions in terms of an integrated framework: to have an open discussion of the concept of multifunctionality and to involve a sociological perspective in exploring local perspectives in the case-study areas. Again, the case-study areas were selected as a platform for co-operation and the integration of the different perspectives involved.

At the end of the day, however, the concern for an interplay between the three modelling tools meant that economy got a hegemonic position with regard to both the definition and operationalisation of the notion of multifunctionality and the questionnaire instrument through which the demand of multifunctionality was explored in the case-study areas. Only those observations that could be translated into the language of economic modelling were regarded as observations in the project. We think this is similar to what happens in many projects involving more perspectives and disciplines: integration is based on the hegemony of one discipline. It is not a question of more or less sympathetic approaches; the hegemonic position of one perspective always violates other perspectives.

To sum up, a framework for dealing with multifunctionality in a multidisciplinary way must relate to the following core problematic:

- Multifunctional agriculture cannot be meaningfully reduced to a single perspective.
- Multifunctionality constitutes a disciplinary challenge with respect to its definition and the methodology used in multidisciplinary research.
- Communication difficulties arise from these facts, though they may not be insurmountable.

From a semiotic standpoint, we have constructed a polyocular framework to interrelate various disciplinary perspectives. This theoretical construction leads to a methodological outline of how multidisciplinary observations of multifunctionality can be taken into practice, and how, at the same time, multifunctional agriculture can retain its dynamic character.

A polyocular framework for multidisciplinary studies of multifunctionality

The theoretical framework that we present in what follows is primarily inspired by Peircean semiotics, Luhmannian systems theory and the tradition of actor-network theory (ANT).

A semiotic understanding of functions

Multifunctionality implies the existence of multiple functions, but the question is how these functions come about. An objectivist would point to the internal characteristics of the object that potentially give rise to its functions. This point of view is widespread

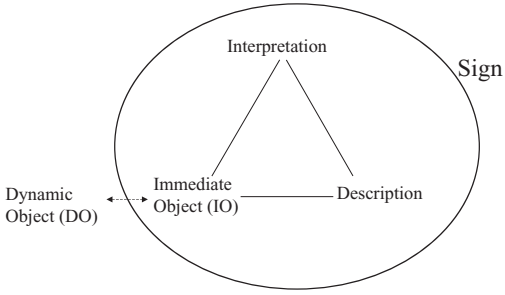

Figure 1: *The relationship between the dynamical object and the three elements of the sign, immediate object, interpretation (interpretant), and description (representamen), based on Peirce's semiotic*

within, for example, the landscape ecology tradition (Brandt and Vejre 2003, 2004), but it furthers a mechanistic understanding of the properties of objects as determinant for functions in and by themselves.

But a function, as a concept, is an action with an implicit purpose, implying concepts such as agency, effect, performance and achievement. This leads to a hermeneutic perspective on the character of functions. In this frame of reference, functions do not exist only with reference to the object; they always need an observer or an interpretation that can provide a meaningful perspective from which a function can be deemed as functioning. This hermeneutic aspect of functions can be analysed in a terms of a Peircean semiotic framework. According to Peirce, 'A sign is something which stands to somebody for something in some respect or capacity.' (Peirce 1958 vol. 2, p. 228) and 'it is necessary to distinguish the Immediate Object, or the Object as the Sign represents it, from the Dynamic Object, or really efficient but not immediately present object' (Peirce 1966 [1908], vol. 8, p. 343).

The semiotic relation between the really efficient dynamic object and the immediate object that represents the dynamic object is graphically illustrated in Figure 1.

An example that illustrates the elements of signification and the semiotic relation between the immediate and the dynamic object could be the sign 'dairy cow'. 'Dairy cow' is the description (representamen, in Peircean terms) of the immediate object of a cow with respect to its ability to produce milk. The immediate object has its ultimate reference point in the dynamic object of a cow as an animal with a surplus of possible functions, such as meat, skin colour and ability to eat grass – reference points that could be the immediate objects of other signs that refer to the cow as a dynamic object. Finally, the interpretation of the sign could be 'a cow producing milk for the market'.

If we take another example of signification in relation to a cow as dynamic object, the description 'grazing cattle' would represent the immediate object of a cow with respect to its quality of living from eating grass and other vegetation, again with an ultimate reference point in the dynamic object of a cow, and the interpretation of the sign could be 'an animal that conserves meadows and fringes by keeping them free of seedlings and tall vegetation'.

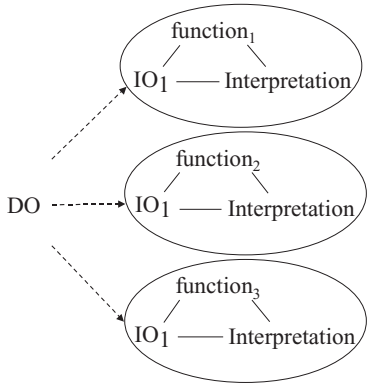

Figure 2: *A semiotic understanding of functions, each with their own immediate object (IO) and interpretations, and multifunctionality in relation to the dynamic object (DO)*

According to Peirce, three analytically distinctive operations are performed within the signification process. One is the selection of an immediate object from the redundancy of possibilities of the dynamic object, another is assigning it a description and the third is assigning it a logic linking the quality of the immediate object with its function or use, the interpretation. Peirce uses the notion of habits of signs that assign a shared linguistic meaning. In Peirce's formulation, there is no position from where we can observe the dynamic object as such: every perspective only adds to the number of immediate objects that refer to the dynamic object. This semiotic understanding is the foundation of Peirce's theory of science.

Based on these examples, a function can be determined as a semiotic relationship that comprises an immediate object and an interpretation with reference to a dynamic object (Figure 2). Referring again to the first example above, 'dairy cow' is a description of one of the functions of a cow. The ascription and existence of functionality necessarily involves a signification process, and the Peircean semiotic offers a theory and a terminology for the deeper analysis of functionality.

The hybrid semiotic and interactive relations of multifunctionality

We have developed above an understanding of function as a semiotic relationship. Before we can elaborate on an empirical framework dealing with multifunctional agriculture as a dynamic object, we need to go one step further in developing this semiotic understanding of functions.

The Peircean notion of the dynamic object may also be understood as a conception of the object 'en soi' prior to any observation or labelling.[3] Even though signs belong to observers in some sense, they depend on the potentiality of the dynamic objects; the objects may strike back, they may determine the sign in certain respects. Recognising functions as semiotic is a big and necessary step toward understanding multifunctionality, but it also presents us with a new problem; that of better understanding the relation between signs and immediate objects on the one hand and dynamic objects

on the other. The relation between a function and its dynamic object is not only a semiotic reference to an object 'en soi', but also an interactive relation.

In search for a theoretical platform to help us understand the hybrid semiotic and interactive relations of multifunctionality, we turn to the heirs of semiotics in ANT. ANT unfolds to us the dynamics of 'l'être pour soi', that is the relatively independent reality of immediate objects, and by doing so they point to the co-evolution of dynamic objects with immediate objects.

Digging deeper into the exact lines of dynamic interrelations between the dynamic and immediate objects requires a short introduction to ANT notions of actor and network.

> An 'actor' in ANT is a semiotic definition – an actant – that is, something that acts or to which activity is granted by others. (Latour 1997, p. 6)

In accordance with this definition we will use the term 'actant' for the actors of ANT. The notion of an actant is not linked to the quality of the entity as such, but to the quality of the entity in the frame of the network into which the entity is mobilised:

> For the semiotic approach tells us that entities achieve their form as a consequence of the relations in which they are located. But this means that it also tells us that they are performed in, by, and through those relations. (Law 1999, p. 4)

When Peirce philosophy is translated into ANT terminology, the immediate object is equivalent to the actant within actor networks. The sign is equivalent to the network, that is, the context in which the dynamic object is actualised in some respect or capacity in the network. Like the immediate object that exists only within the triadic sign in the presence of an interpretant, actants are performed only within actor-networks:

> [Actor-networks] are neither objective nor social, nor are they effects of discourse even though they are real, and collective, and discursive ... the networks are simultaneously real, like nature, narrated, like discourse and collective, like society. (Latour 1993, p. 6)

In ANT there is no hierarchy of interaction. Heterogeneous actors in actor-networks like knowledge, machines, livestock and chemical products are all at the same level of interaction in the network; each element is able to influence strongly the interpretation of another and each element links to other elements accordingly. Therefore, within the network, there is no subject–object hierarchy, just internal functionality.

ANT helps us to grasp the evolutionary dynamic interaction between the dynamic object and the immediate object, which, as a co-evolutionary process, contributes to the potentiality of the dynamic object. In other words, our interactions with the world influence the potentiality of the world. New dynamic objects or new aspects of the dynamic objects are continually generated by the interplay between dynamic and immediate objects and, as a consequence, reality evolves and expands.

From a Luhmannian point of view, new objects can be generated only by way of selecting possibilities. Noe and Alrøe (2003, 2005a, 2005b) have described the autopoiesis (self-creation) of actor-networks through selection using the example of a farm enterprise. Seen from an autopoietic point of view, food production may be organised in numerous ways according to different goals and purposes. The farm enterprise as

a heterogeneous social system is not only forced to select from the contingency of the potential dynamic objects that can be mobilised into the farming processes as immediate objects, but also from the contingency of the potentiality related to each dynamic object behind the immediate object that is enrolled. Thus, for example, a computer can be enrolled as device for the yearly accounting or as part of a daily steering system.

This leads to the understanding that multifunctionality arises only as a consequence of the differentiation of perspectives; it exists due to the unfolding of different actor-networks. Each perspective attaches different values, understandings and interests to the dynamic object. In terms of functionality and potential reality there is a great deal of difference as to whether a landscape is seen in light of agricultural production, ecosystem services, environmental protection, hunting, rural development or aesthetical experience.

In the following part we explain why communication of a certain type is needed for a successful multidisciplinary study of multifunctionality.

The paradox of multifunctionality

As previously explicated, a function is a semiotic relation where an immediate object is selected by an observer – or, in ANT terminology, a relation where a dynamic object is actualised as an actant in an actor-network. Functions can be shared by a broader collective of observers, provided that they perform similar selections with respect to the dynamic object. However, in a differentiated society there are infinite ways in which to generate and attach meaning. The sharing of a description does not secure the sharing of immediate objects in the interpretations of different observers.

In a Luhmannian perspective, each scientific discipline operates as a specialised function system and Luhmann points to the fact that functional, action-oriented perception or precognition is a precondition to specialised disciplinary knowledge. Each discipline has its own perspective. Analogous to broader functional differentiations in society (see Luhmann 1995), disciplinary differentiation processes take place where the disciplinary networks and perspectives are differentiated into new and more specialised disciplines, and their institutionalisation undergoes a concurrent process of symmetrical differentiation.

Thus, by generating a habit for seeing a yield through the perspective of food production, a commodity through the perspective of the market and a social interaction through the perspective of culture and society, each disciplines pre-cognises certain functions. It is exactly because of this precognition that it is possible to further differentiate between various forms of yields, commodities or relationships. To perceive, by ascribing a function to an object, simply releases the amount of mental capacity prerequisite to the performance of deeply specialised science (Luhmann 1995).

As a negative but logical result of disciplinary, functional differentiation, disciplines generate blind spots as to the values and interests attached to objects by other disciplines. These values and interests are considered largely irrelevant as long as they are not translated into the logic of the specific discipline in question. In other words, agronomy relates to biology by asking how biodiversity could influence the production

relationship between yields and foods. Another unintended consequence of using differentiated 'immediate objects' as representations of 'dynamic objects' in different disciplines is that communication becomes troublesome, if not directly improbable.

In conclusion, we are confronted with the paradoxical fact that the highly specialised functions of agriculture arise only because functional interpretations and functionally motivated observations are performed by distinctly differentiated disciplines. At the same time multifunctionality, as a way of mediating between conflicts and interests, can be a fact only when different functions and observations of functions combine. Furthermore there is no way back to an undifferentiated world and science; differentiation is an irreversible process. The only way leads forward.

The challenge of polyocular communication

To loosen this apparent Gordian knot, we need to turn to a qualitatively different type of cognition. We do this by introducing the Japanese theoretician, Magoroh Maruyama.

Like Peirce and Luhmann, Maruyama is engaged in the problem of cognition, but in contrast to the former authors he focuses upon perceptive depths. Considering Bateson's binocular vision, which makes use of the differences between the two images to enable the brain to compute a depth that is invisible to either eye, Maruyama invents the concept of polyocularity. In polyocular vision, the differences between several images enable us to compute invisible dimensions that cannot be obtained by adding several images (Maruyama 1978, 1985, 1995, 2004). In Bateson's (1979) terms, the information brought by depth is of a different logical type from the information gained from the two separate images. We can expect to find such invisible dimensions whenever we compare different images, in line with Bateson's definition of information as 'difference that makes a difference', i.e. a cognised difference at a different logical level. Thus, according to Maruyama's concepts, what renders the most comprehensive and meaningful understanding of an object is the difference between plural oculars.

Translating Luhmann's theory of disciplinary differentiation into Maruyama's vocabulary, we could say that, in contrast to individual cognition, disciplinary cognition is mono-ocular, due to the logic of differentiation. In order to be able to specialise disciplines have a one-dimensional way of recognising. Consequently, if the sciences are to reach a multifunctional understanding, they have to mobilise their observations as actants in multidisciplinary communication.

Figure 3 expresses this idea in a concrete form. This figure illustrates how different disciplines observe and ascribe different functions to the same dynamic object. The disciplinary communication is not enlarged or extended to multidisciplinary communication. But multidisciplinary communication depends on mobilising the facts and insights produced by the disciplines. Multidisciplinary and disciplinary communications need to be separated, and thereby to be the environment for each other, because the two types of communications operate with different logics, interests and values. The figure additionally describes how – as an essential part of multidisciplinary communication –individual disciplines are stimulated to reflect upon their own cognition.

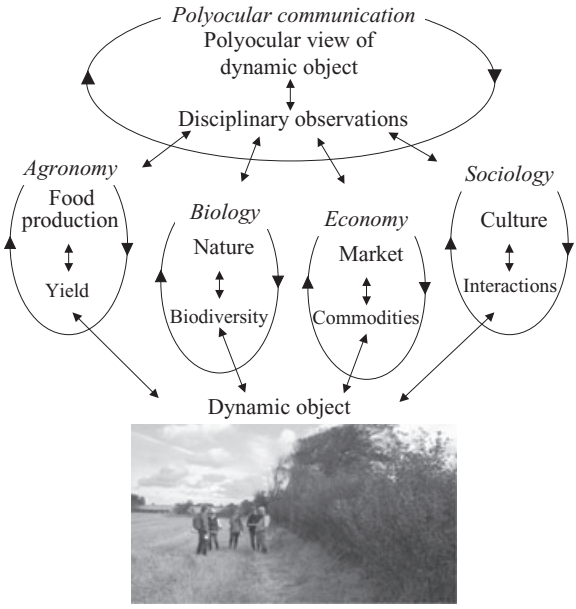

Figure 3: *The relationship between disciplines and multidisciplinary communication*

Finally, we turn to a discussion of how such multidisciplinary communication can be organised in praxis by returning to the two cases described in the first part of this article.

How can the framework of polyocularity help multidisciplinary work on multifunctionality?

This article has shown how the notion of multifunctionality has evolved from a differentiation of perspectives and the consequences of this differentiation process. The differentiation of perspectives improves our ability to pursue the goals of each perspective: increase the yield, reduce the costs, increase the productivity, and so on. However, the price to pay for this efficiency is the blindness of the dominating perspectives to new societal demands on agriculture, together with the unintended side effects, which the differentiated perspectives cannot deal with and which threaten the sustainability of the resulting production systems.

In its short history, various approaches have been offered as solutions to the problematic of multifunctionality. There is an agreement in the literature on the necessity of involving many disciplines to cope with the many aspects or perspectives of multifunctional agriculture. The major solution has been to strive for holistic or system-orientated approaches that try to cope with all the relevant functions or perspectives at the same time. On the face of it, this seems to be a very promising approach but in practice, this approach generally fails to reintegrate the different

perspectives, and, worse still, neglects its own necessary blindness through its self-understanding as being systemic or holistic and, hence, 'all-seeing'.

In this article we have identified two key problems of working multidisciplinarily with multifunctionality: how to handle the different objects of different disciplines in multidisciplinary research, and how to integrate the different functions in multifunctionality. We have introduced a theoretical platform with two key notions that we argue can constitute a fruitful pathway for multidisciplinary work on multifunctionality. The first notion is the dynamic object and the other is polyocularity.[4]

Returning to the cases described earlier, how can the theoretical platform and the notions of dynamic object and polyocularity help us to overcome the problems that we have identified?

In the case of the quality of nature project, the notion of an immediate and a dynamic object could help to understand and handle the fundamental problem of multidisciplinary projects: that immediate objects belong to perspectives and thereby to the different disciplines that produce these perspectives. The inner logic belonging to any one of biological, geographical and sociological perspectives on the quality of nature cannot interlink the immediate objects of the different perspectives. Only a second-order process can links between these different immediate objects be discussed and related to each other without violating the insights that have been generated by the perspectives involved. There is no blueprint as to how to conduct this second-order process, but acknowledging the limitations of the first-order perspectives is a precondition for any second-order communication. These communication problems were realised only at a very late stage in the research project, and at that time it was too late to do anything substantial about it in synthesising the project. We believe that it is important, very early in such a project, to work on a second-order understanding of the dynamic object, which may interlink and connect the first order immediate objects of the involved disciplines. While working in the same workshop area is helpful and fruitful, but this alone is not enough to ensure a second-order platform for a shared dynamic object in terms of interrelated immediate objects.

With regard to the second case, the MEA-Scope project, the platform does not offer any easily applicable solution. MEA-Scope is an example of a project where one disciplinary perspective has taken a hegemonic position to integrate multifunctionality. The only way out of this problem is to acknowledge that the economic modelling provides only one perspective on the dynamic object, and to acknowledge that the output of the model is just one of the inputs to a separate polyocular communication process in the project, instead of demanding that the input of the other perspectives must be translated into inputs to the economic modelling.

Beyond the paradox of multifunctionality

The paradox of multifunctionality is that, on the one hand, the specialised functions of agriculture arise only because of the functional differentiation of social systems and scientific disciplines and, on the other hand, multifunctionality can only enter as a way to mediate between conflicts, interests and fragmented knowledge, when different functions and observations of functions combine.

This paradox is the main cause of the difficulty of multidisciplinary research on multifunctional farming, but it is also the source of a new understanding. The way to overcome this paradox is not to go back to a pre-differentiated science, but to move forward to incorporate communication processes of a second-order.

The notions of polyocular cognition and polyocular communication offer a theoretical understanding and platform for this second-order, interdisciplinary communication for creating both the shared object that we saw in the quality of nature case, and a polyocular view on the multifunctionality of the dynamic object. These two processes, creating a shared object and a polyocular view, are totally interdependent, because second-order multidisciplinary communication can be performed only with reference to a shared dynamic object that we agree can be perceived in a number of different ways. Furthermore, polyocular communication must be based on rules other than those of the disciplines involved. Whereas disciplinary communication is about providing consistent, efficient and precise knowledge in the context of a sharply delimited research world, polyocular communication is about extending a multidimensional space of understanding.

Notes

* Corrresponding author.

1 We use 'science' in a broad sense to include social sciences and the humanities.

2 Nature Quality in Organic Farming, a research project under the Danish Research Centre for Organic Food and Farming Available online at http://www.darcof.dk/research/darcofii/iii5.html and http://orgprints.org/view/projects_refereed/da2c5.html (both accessed 14 January 2008)

3 'En soi' is a term used in the Sartrean philosophy of existence (Sartre 1943).

4 In a separate article (Alrøe and Noe 2008) we have applied these notions in a slightly different manner, using a polyocular approach to different (non-disciplinary) actor perspectives on the dynamic object of organic agriculture.

References

Alrøe, H.F. (2000) Science as systems learning: some reflections on the cognitive and communicational aspects of science. *Cybernetics & Human Knowing* 7 (4) pp. 57–78

Alrøe, H.F. and E.S. Kristensen (2002) Towards a systemic research methodology in agriculture: rethinking the role of values in science. *Agriculture and Human Values* 19 (1) pp. 3–23

Alrøe, H.F. and E. Noe (2008) What makes organic agriculture move – protest, meaning or market? A polyocular approach to the dynamics and governance of organic agriculture. *International Journal of Agricultural Resources, Governance and Ecology* 7 (1/2) pp. 5–22

Bateson, G. (1979) *Mind and nature: a necessary unity* (New York: Bantam Books)

Brandt, J. and H. Vejre eds (2003) *Multifunctional landscapes – monitoring, diversity and management*. Vol. II (Southampton: WIT Press)

Brandt, J. and H. Vejre eds (2004) *Multifunctional landscapes – theory, values and history*. Vol. I (Southampton: WIT Press)

Gorman, M., J. Mannion, J. Kinsella and P. Bogue (2001) Connecting environmental management and farm household livelihoods: the rural environment protection scheme in Ireland. *Journal of Environmental Policy and Planning* 3 (2) pp. 137–147

Hansen, L., E. Noe and K. Højring (2006) Nature and nature values in organic agriculture. An analysis of contested concepts and values among different actors in organic farming. *Journal of Agricultural and Environmental Ethics* 19 (2) pp. 147–168

Huylenbroeck, G. v. and G. Durand (2003) *Multifunctional agriculture – a new paradigm for European agriculture and rural development* (Aldershot: Ashgate)

Kneer, G. and A. Nassehi (1997) *Niklas Luhmann – introduktion til teorien om sociale systemer.* (Niklas Luhman's theory of social systems – an introduction) (Copenhagen: Hans Reitzels Forlag) [Original German edition: Niklas Luhmanns Theorie sozialer Systeme. Eine Einführung. Munich: Fink-Verlag 1993]

Knickel, K. (2001) The marketing of Rhöngold milk: an example of the reconfiguration of natural relations with agricultural production and consumption. *Journal of Environmental Policy and Planning* 3 (2) pp. 123–136

Knickel, K., H. Renting and J.D. van der Ploeg (2004) Multifunctionality in European agriculture. Pp. 81–103 in F. Brouwer ed., *Sustaining agriculture and the rural development. Governance, policy and multifunctionality. Advances in ecological economics* (Cheltenham: Edward Elgar)

Latour, B. (1993) *We have never been modern* (London: Harvester Wheatsheaf)

Latour, B. (1997) Om aktør-netværksteori. Nogle få afklaringer og mere end nogle få forviklinger *Philosophia* 25 (3–4) pp. 47–64. [English version (1996) On actor-network theory: a few clarifications *Soziale Welt* 47 (4) pp. 369–381. Available online at http://www.nettime.org/Lists-Archives/nettime-l-9801/msg00019.html Accessed 11 January 2007

Law, J. (1999) After ANT: complexity, naming and topology. Pp. 1–14 in J. Law, and J. Hassard eds *Actor-network theory and after* (Oxford: Blackwell)

Luhmann, N. (1995) *Social systems* (Palo Alto, CA: Stanford University Press)

Marsden, T. (2003) *The condition of rural sustainability* (Waageningen: Royal van Gorcum)

Maruyama, M. (1978) Endogenous research and polyocular anthropology. Pp. 79–126 in R. Holloman and S. Arutiunov eds, *Perspectives on ethnicity* (The Hague: Mouton Publisher)

Maruyama, M. (1985) Mindscapes: how to understand specific situations in multicultural management. *Asia Pacific Journal of Management* 2 (3) pp. 125–149

Maruyama, M. (1995) Individual epistemological heterogeneity across cultures and its use in organisations. *Cybernetica,* 37 (3) pp. 215–249

Maruyama, M. (2004) Polyocular vision or subunderstanding? *Organization Studies* 25 (3) pp. 467–480

MEA-Scope (2007) Model of European Agriculture Micro-economic instruments for impact assessment of multifunctional agriculture to implement the Model of European Agriculture. A policy-oriented research project of the European Commission Sixth Framework Programme (2007) Available online at http://www.mea-scope.org Accessed 14 January 2008

Moreira, M.B. (2004) Globalization: the end of the social contract in agriculture. Keynote speech of the Sixth International Farming Systems Association European Symposium. Vila Real, Portugal 4 April

Mielgo, A.M.A., E.S. Guzmán, M.J. Romera and G.G. Casado (2001) Rural development and ecological management of endogenous resources: the case of mountain olive groves in Los Pedroches Comarca (Spain). *Journal of Environmental Policy and Planning* 3 (2) pp. 163–175

Noe, E. and H.F. Alrøe (2003) Farm enterprises as self-organizing systems: a new transdisciplinary framework for studying farm enterprises? *International Journal of Sociology of Agriculture and Food* 11 (1) pp. 3–14

Noe, E. and H.F. Alrøe (2005a) Combining Luhmann and actor-network theory to see farm enterprises as self-organizing systems. *Cybernetics and Human Knowing* 13 (1) pp. 34–48

Noe, E. and H.F. Alrøe (2005b) The challenge of management of multidimensional enterprises analysed from a logo-poietic perspective. Working paper. Available online at http://orgprints.org/3909/ Accessed 11 January 2008

Noe, E., N. Halberg and J. Reddersen (2005) Indicators of biodiversity and conservational wildlife quality on organic farms for use in farm management. *Journal of Agricultural and Environmental Ethics* 18 (4) pp. 383–414

Norgaard, R.B. (1994) *Development betrayed – the end of progress and a coevolutionary revision of the future* (London and New York: Routledge)

OECD (2001) Multifunctionality towards an analytical framework. Available online at http://www.oecd.org/dataoecd/43/31/1894469.pdf Accessed 23 January 2008

Peirce, C.S. (1958 [1897]) *Charles Sanders Peirce, collected papers*, vol. 2. Edited by Charles Hartshorne and Paul Weiss (Cambridge, MA: Belknap Press of Harvard University Press)

Peirce, C.S. (1966 [1908]) *Charles Sanders Peirce, collected papers*, vol. 8. Edited by Arthur W. Burks (Cambridge, MA: Belknap Press of Harvard University Press)

Ploeg, J.D. v. d. and H. Renting (2000) Impact and potential: a comparative review of European rural development practices. *Sociologia Ruralis* 40 (4) pp. 529–543

Ploeg, J.D. v. d. and H. Renting (2004) Behind the 'redox': a rejoinder to David Goodman. *Sociologia Ruralis* 44 (2) pp. 233–242

Roest, K. de and A. Menghi (2000) Reconsidering 'traditional' food: the case of Parmigiano Reggiano cheese. *Sociologia Ruralis* 40 (4) pp. 439–451

Sartre, J.P. (1943) *L'Être et le Néant* (Paris: Gallimard)

Tybirk, K., H.F. Alrøe and P. Frederiksen (2004) Nature quality in organic farming: a conceptual analysis of considerations and criteria in a European context. *Journal of Agricultural and Environmental Ethics* 17 (3) pp. 249–274

Ventura, F. and P. Milone (2000) Theory and practice of multi-product farms: farm butcheries in Umbria. *Sociologia Ruralis* 40 (4) pp. 452–465

Wilson, G.A. (2007) *Multifunctional agriculture – a transition theory perspective* (Wallingford: CABI)

Egon Noe*
Danish Institute of Agricultural Sciences
Department of Agroecology and Environment
P.O. Box 50, DK-8830 Tjele
e-mail: Egon.Noe@agrsci.dk

Hugo Fjelsted Alrøe
Danish Research Centre for Organic Food & Farming (DARCOF)
e-mail: hugo.alroe@agrsci.dk

Anne Mette S. Langvad
Regional Development, Central Denmark Region
Skottenborg 26, 8800 Viborg
e-mail: AM.Langvad@ru.rm.dk