ELSEVIER

Landscape and Urban Planning 57 (2001) 159–168

LANDSCAPE AND URBAN PLANNING

www.elsevier.com/locate/landurbplan

Multifunctional landscapes—towards transdisciplinary research

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Abstract

This paper deals with the process of integration required to study multifunctionality in agricultural landscapes. It examines what we really understand by integration between subject disciplines and how we can move from independent parallel disciplinary studies carried out in the same area to increasing degrees of interdisciplinarity. I explore the current interest in interdisciplinarity with the aim of mapping out what we can expect interdisciplinary research to achieve and what it will not. The main part of the paper examines the process of working across subject boundaries, and the problems from practical and theoretical perspectives. The major barriers facing interdisciplinarity in landscape research are academic traditions, the merit system and lack of theory. To meet the challenges of interdisciplinarity, we need to focus on theory development, training of researchers, team building, finding common aims and rewarding good practice. Finally, I discuss the drafting of a code of good practice and criteria for assessing quality in interdisciplinary research.

Keywords: Interdisciplinary; Landscape research; Research training; Research assessment

1. Introduction

Agricultural landscapes are multifunctional landscapes requiring research and management approaches that cross traditional subject boundaries. We have in the past looked at the various functions of landscape mostly from a series of single subject perspectives. This has had only limited success in reducing countryside conflicts. Planning and management decisions for improving crop production, biodiversity, landscape, amenity, or other environmental functions, cannot be made outside the context of human needs and wishes. Single subject approaches fail to incorporate this context and, moreover, fail to consider how promoting one countryside interest will interact with others. Landscape structure and function affect and are affected by human perception, cognition, and values (Nassauer, 1995). Although strong links may exist between landscape configurations that meet environmental goals and human needs, very few studies have systematically examined relationships between functions related to ecological sustainability and the human perception of landscape. Such relationships, therefore, remain unclear.

One approach to studying the relationships between different landscape functions is by performing parallel studies (where research teams work in parallel to investigate different aspects of a common problem) and comparing their results. Well-designed studies of this kind with a clear focus and shared study sites can provide us with many useful insights into landscape processes. Nevertheless, if we wish to attain a deeper understanding of the way multifunctional landscapes operate, then we need to go beyond this level and understand the nature of the interactions between different countryside interests. This is a more challenging prospect as it necessitates researchers leaving the safety of their academic territory and traditions to

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0169-2046/01/$20.00
PII: S0169-2046(01)00201-8

reach an understanding of how other subject areas comprehend agricultural landscapes and the way they work. This paper examines the reasons for taking that step and specifically the process of researching beyond traditional subject boundaries.

Disciplinarity is the term we use to describe the way scholarly endeavour, and particularly science, has evolved into specialisms. Such specialisms are a convenient demarcation of a field of knowledge but also a demarcation that often has no reality in nature. Interdisciplinarity occurs when we combine the knowledge fields of several subjects. At the far end of this scale are true transdisciplinary studies reaching a high degree of integration where theories, models and methods merge. I consider interdisciplinary landscape research as that which attempts to go beyond the level of parallel studies and endeavours to understand the underlying relationships between different subjects and develop theory across disciplinary boundaries to gain a transdisciplinary understanding of landscape processes. For this paper, I accept as my topic all research that attempts to do more than a simple comparison of the results of parallel studies by different disciplines carried out in the same geographical area.

As this paper is based mainly on my own experiences of interdisciplinary work, I should state my standpoint. I have gained more than 15 years of experience on this topic through (a) working with and leading interdisciplinary research projects, (b) as a referee for international environmental science journals, (c) reviewing grant applications for funding of interdisciplinary projects in the UK, New Zealand, Norway, Sweden and Denmark and The Netherlands, (d) post-project appraisal of interdisciplinary projects, and (e) the supervision of Ph.D. students engaged in interdisciplinary research. I have an academic background in landscape ecology in its widest sense and have carried out research on various aspects of landscape from the dispersal of animals to human perception, and from archaeological prediction models to crop protection. I admit to a high level of commitment to interdisciplinary work and a belief that through interdisciplinary work we will achieve better management of natural resources. I further believe that interdisciplinarity is an area where we may expect major breakthroughs in environmental science. This is not to say that this paper in any way negates good research in any single discipline as I am sure that single disciplinary work will continue to provide many of the tools required for managing multifunctional landscapes. However, when it comes to making decisions about the management of natural resources, single subject approaches will not be enough.

2. Why are we interested in interdisciplinarity?

The planning and management of the countryside has been characterised more by tension than cohesion during the past 50 years due to the sharp demarcation of sectoral interests. It has been here where tensions have been apparent between agricultural and environmental sectors. Even after the promotion of sectoral responsibility for the environment following the Rio convention on biodiversity, different and often opposing visions for the landscape exist. The countryside is currently a confusion of interests often providing conflicting advice and grant aid to farmers. As a result, farmers are confused by the conflicting messages they receive concerning what they are meant to produce in terms of food, recreation, attractive landscapes, and their roles as protectors and enhancers of important landscapes and wildlife habitats. In response to the current situation, research and development initiatives aimed at achieving a more holistic management of agricultural landscapes have blossomed. This is clearly seen in the rapid development of methods for landscape character assessment (Usher, 1999) and attempts to identify important non-trade landscape functions supplied by agriculture, e.g. through the analysis of natural capital (CAG/LUC, 1997). It is also reflected in the emergence of *landscape* as a level of organisation in countryside management. Political support for a more integrated perspective of landscape interests is further reflected in the establishment of large-scale interdisciplinary projects throughout Europe covering a wide range of land use issues but especially those related to agricultural and forest landscapes (Selman, 2000).

The important aspect is that countryside policy in many countries is in favour of integrated approaches to landscape. Such approaches will demand new knowledge from research environments to increase our understanding of the way landscapes function and how people shape and are shaped by landscape

processes (Golley and Bellot, 1991). International agreements on biodiversity and landscape conservation have also increased this demand. What these developments are trying to achieve is a better understanding of how agricultural landscapes work through combining humanistic and natural sciences approaches in their study. It is expected that this will lead to improved ways of managing agricultural landscapes—ways where policy objectives form a coherent approach and move away from traditional sector bias.

3. Being realistic about what integration will NOT achieve

Before we consider the process of interdisciplinary research, it is necessary to consider how realistic we are about what it can and cannot achieve. This also demands us to be realistic about the role of landscape research. I argue that the process of interdisciplinary research has limitations that often appear to be overlooked by management and those financing interdisciplinary studies.

Increasing our understanding of how multifunctional landscapes work will NOT remove all land use conflict. Interests will continue to conflict with each other and hard decisions will have to be taken. Concerning land use issues, science tells us what we can do and maybe even how to do it better than today, but not what we should do (Lawton, 1998). This is the realm of ethics, philosophy, religion and value systems (Höll and Nilsson, 1999; Arler, 2000; Head, 2000; Oreszczyn and Lane, 2000). Values pervade science from the choice to study a particular question through the interpretation of results, but how often are these issues made explicit? One of the reasons that ecologists get into difficult conflict situations is that they sometimes believe that if only everyone else knew what they know, then this interest would become the top land use issue. Unfortunately, when this specialist knowledge concerns small insects, lower plants or other non-emblematic species, it is not at all automatic that other groups will be willing to give their own interests a lower priority.

Not only, will interdisciplinarity fail to remove all conflict, but also it may weaken the case for our own specialist interest. A deeper understanding of the importance of landscapes for the interests of others may compromise achieving one's own specific environmental or development goals. This is well-known to government departments where it may even affect the appointment of new managers. As an example, I have been a member of appointment boards where good candidates (at least in my ranking) were passed over in favour of more specialist applicants based on the argument that generalists would too easily see the opposition's point of view!

It is also too much to expect interdisciplinary studies to be able to convert all environmental conflicts into win–win situations. There are many situations where it is simply not possible to compromise between conflicting interests: either one interest wins or the other. A compromise may result in neither winning. Let us take the example of the management of archaeological sites in the agricultural landscape. In Scandinavia, it may be appropriate for cultural heritage interests to manage sites such as Viking grave mounds (mostly stone or stone and earth mounds) in as near an original form as possible. Management might include vegetation clearing or landscape manipulation involving larger scale vegetation management to restore important visual relationships between grave mounds. Nature conservation interests may be threatened by these plans and objections raised because these cultural sites have developed into special habitats for unusual plant communities. Although this is true, some vegetation such as bushes and trees may even threaten cultural monuments through root growth or the risk of wind throw or prevent necessary restoration and site interpretation measures.

I have the impression that many political interests in the countryside believe that interdisciplinarity has some inherent properties that will ease countryside management. Interdisciplinarity may help us to see other points of view, but it will not make the decisions necessary for a more sustainable landscape management. What interdisciplinary research may provide us with are new options for the design and management of *futurescapes*. By *futurescapes*, I mean the landscapes of the future that may be so far from our current landscape visions that they seem fantasy. If this sounds rather odd, I ask you to consider whether in the 1960s we would have predicted that within 40 years farmers would be paid to manage visual landscapes, maintain biodiversity, grow weeds, restore surface drainage from underground pipes, excavate new farm ponds,

divide fields into smaller units with hedges, set-aside arable land, etc.

4. Frustrations and barriers to interdisciplinarity

Several authors have reflected on the practical and theoretical problems associated with interdisciplinarity (Heberlein, 1988; Vedeld, 1994; Mistra, 1998; Höll and Nilsson, 1999; Naimen, 1999; Pickett et al., 1999; Rosa, 1999). Identifying such problems is the first step to solving them. When an idea such as interdisciplinarity becomes politically correct, it is all too easy to ignore or minimalise real problems. Although I strongly support the current movement towards interdisciplinary research, I am very much aware that there exist considerable problems associated with the operational aspects of interdisciplinarity.

4.1. Sociology of academia

Perhaps the greatest barriers to working across subject boundaries are related to what can be considered the sociology of academia. All subjects like to protect their own worlds and they develop ways of working which evolve into standard methods and research approaches. Many research establishments are old and based on long traditions and set ways of working. Some are very conservative and often show scant respect for other disciplines. Such cultures can and do constitute real barriers to those wanting to work across traditional subject boundaries. The development of specialised language (subject jargon) or the adoption of common terms to mean something special within an academic discipline can also act as barriers to communication between subjects. In a recent Internet discussion forum on multifunctional agricultural landscapes (agr'99-Conference at http://www.usda.gov/nass/pubs/agr99/) there was a request from participants to reduce jargon and use plain language, especially the avoidance of terms specific to particular disciplines.

4.2. Language and meaning

At the risk of being politically incorrect, I argue that the current dominance of a socio-economic jargon in many policy branches has made the problems associated with language worse. This is partly because it is being forced on all academic subjects related to natural resource management. We can observe clear evidence of this in the adoption of this jargon in research grant applications for shared cost EU projects and to national funding agencies. I react against the trend for several reasons, but mainly because it is fuzzy, it is sometimes patronising, and because this jargon externalises and objectifies landscapes and the people living in them. We talk about actors, stakeholders, customers, cross-compliance payments, sectoral targets, and we engage in optionalising, foresighting, outreaching, rightsizing, clustering and consensual reporting. Oh for simple, direct language and a drastic reduction of euphemisms!

4.3. Qualitative and quantitative approaches are often worlds apart

One of the major splits in the academic world remains between the natural sciences and the humanities. The division often follows the axis separating qualitative and quantitative research methods. At an international conference on history held in Oslo in 1999, a commentary in the national newspaper Dagbladet (10 December 2000) reported that despite many moves to reconcile the qualitative/quantitative divide within historical research, the humanities continue to suffer a deep number phobia while the natural sciences maintain a blind faith in numbers. We can see some of the same tensions in landscape research, although there have been some very good recent examples of both sides trying to overcome the divide. We have increasing examples of scientific approaches to human perception and cognition of the view (Bishop and Hulse, 1994; CAG/LUC, 1997; van Mansvelt and Stobbelaar, 1997; Burel and Baudry, 1995) and humanistic and social science approaches to landscape management issues (Endter-Wasa et al., 1998; Oreszczyn and Lane, 2000).

4.4. The merit system and peer review

The merit system in research, and especially publication and peer review, can appear to be biased against interdisciplinary studies of landscapes. Although, there appears to be a widespread acceptance of this bias, I believe it is changing. For example, the Academic

Review Process in the UK has found no systematic bias against interdisciplinary research (see http://www.niss.ac.uk/education/hefc/rae2001/1_99.html). A greater problem than negative bias from research assessments of interdisciplinary work may be the different research perspectives found in different landscape disciplines. These differences go as deep as major divides over what constitutes research and research outputs (see discussions in Landscape Research, volume 23, 1988). Subjects with a long research tradition have well-developed research methods, analytical tools and research products. Younger subjects are still in the process of developing these and, in addition, may suffer heated internal competition for dominance of an emerging field of study (Heberlein, 1988).

In practice, we find great differences between academic subjects in what constitutes merit points. Even if agreement can be reached on what should count as meritable work, there is yet a further problem; the significant differences between subjects in the merit required at each stage of the career ladder. This phenomenon is very easy to observe but a very delicate topic to discuss. If you are in any doubt that such differences exist, just take a look at the annual reports of different university departments and at the CVs of newly appointed lecturers, senior lecturers and professors in different subjects. There are significant differences that would appear to demonstrate that it is far more difficult (based on the criteria of quantifiable research outputs) to reach any given stage of career in some subjects than others. These factors affect the willingness of young researchers chasing tenure to co-operate with subjects where research merit is based on different products.

4.5. Publishing interdisciplinary landscape research

Publication in international, refereed, scientific journals remains the most significant research product counting towards academic merit. It is, therefore, worth looking more closely at publishing interdisciplinary research. Before I do this, I want to say that it is about time we cast off the myth that it is difficult to publish interdisciplinary research—it is not. Good quality interdisciplinary research has little problem in being accepted for publication, with several journals giving interdisciplinary work a high priority. The situation has changed rapidly over the past few years such that high impact journals in the environmental sciences are publishing interdisciplinary papers. This is not the same as saying that it is easy to publish interdisciplinary research. It may be difficult to publish simply because it takes more time and effort to write articles when more than one subject is involved. Having to find a common style, the correct choice of words, etc. may slow the process of writing and this may reduce the output of published articles, but it is not because journals are biased against interdisciplinary work. It is also true that merit points may be more difficult to achieve when publishing interdisciplinary work because of the way different subjects weigh different scientific journals in staff assessments (Daily and Ehrlich, 1999). Bibliometric weighting systems developed for specific subject areas such as biology, physics or physical geography, might not rank highly a journal with an emphasis on interdisciplinary landscape studies (Sivertson and Aksnes, 2000). These factors demand careful consideration in the assessment of interdisciplinary research.

5. Some pathways to successful interdisciplinarity

If we wish to increase the success of interdisciplinary research and its respect in academia, we need to monitor and review its progress. To do this, we need to identify appropriate goals for interdisciplinary landscape research, and criteria for assessing quality and measuring success. Such criteria may require that we encompass both contributions to our understanding of how landscapes work and the impact of such research.

5.1. Developing theory

Although there are several practical barriers to overcome in linking the different disciplinary approaches to landscape, the greatest need is for the development of a solid theory base (Moss, 2000). This is unlikely to evolve from a single discipline, and not necessarily from those subjects with landscape as the central focus. Yet, I feel that landscape ecology in its broadest sense would appear to be the most promising candidate for the development of interdisciplinary theory applicable to multifunctional landscapes. Landscape ecology is an open and inclusive field of

research whose development has crossed and re-crossed subject boundaries. Several of the central ideas in landscape ecology offer a base for interdisciplinary studies. Concepts such as functional connectivity and the role of habitat complementation and supplementation processes have applications in a wide range of natural resource and human ecological studies. Landscape typologies developed for landscape ecological studies (particularly corridors, barriers, patch characteristics, matrix) have contributed much to the conceptual development of wildlife biology, human perception studies, landscape design and impact assessment. Yet, even landscape ecology is in danger of breaking up into sub-areas of specialism. Although this would weaken the subject substantially, the danger is there and can be seen in all established fields such as biology and geography. Fortunately, there are organisations such as the International Association of Landscape Ecology and many landscape professionals who work hard to maintain the diversity and complexity of landscape processes as the core of landscape ecology (Brandt et al., 2000).

We should also remember, that not all subjects have an equally well-developed theory base. Newer fields of research often lack the large body of methods and academic support offered by traditional subjects. It will take time for these to develop and their own identity to emerge. Several of the landscape disciplines are in this dynamic state, e.g. landscape architecture, planning, and many of the social sciences (Heberlein, 1988). Theory development is a high priority in these fields (Nassauer, 1995; Naveh, 1995; van Mansvelt and Stobbelaar, 1997; Rosa, 1999; Moss, 2000).

5.2. Research training

If we reflect on the problems facing the interdisciplinary researcher, it may seem odd that much of the current interdisciplinary research is in the hands of young Ph.D. students. One reason given for this is that young students are more flexible and thus more able to move mentally between subject disciplines. Students learning to research landscapes are, moreover, not fixed in their ways of working and can, therefore, more easily adapt to new ways of working. Yet, interdisciplinary work can make very tough demands on those who participate, requiring reading academic literature across subject boundaries, working with the research methodologies of different academic disciplines and not being sure of the research products or how much they will contribute to personal merit. To this list, can be added the feeling of solitude students may experience when working alone with different methods and data from their colleagues, constantly having to defend why they do what they do. It is much more comfortable for students to work in a hot area of research within a team who share theories, methods and equipment.

To overcome these problems requires an especially high level of commitment by Ph.D. supervisors: a level most likely to be found if supervisors themselves are committed to the integrating process. When supervisors see no benefit in interdisciplinary work, then it will be quickly apparent to the student. The establishment of supervisory teams and research schools can make very positive contributions to training in interdisciplinary research methods. Despite this, I am still unsure whether, as research trainee, it is better for a young scientist to reach the very bounds of knowledge in one subject area than to spread effort thinly over several disciplines. I do not know the answer to this. However, I have noticed that most of the successful young researchers involved in interdisciplinary work, first gained confidence by (1) achieving skills in research methods, (2) reaching depth in an single academic discipline, and (3) experiencing the rigour of peer review. They were then able to reach beyond their discipline to do it again in a second or third subject area and see the relationships between them. As a supervisor of post-graduate students, I sometimes feel we are expecting Ph.D. students to achieve goals we are still unable to reach even with our years of research experience. The issue clearly requires further debate and development (Noss, 1997; Golde and Gallagher, 1999), and the situation for students will undoubtedly improve as the amount of interdisciplinary research increases.

The lack of coherent theories in landscape research is a major problem for young researchers approaching interdisciplinary subjects. A challenge facing research schools is to provide suitable supervisory teams of researchers who themselves are committed to and actively involved in interdisciplinary work, from the planning stage to publication. Fortunately, the opportunities for this are increasing, commonly in landscape departments—where landscapes have never been considered anything else but multifunctional.

5.3. Research leaders and team building

In the absence of strong research traditions offering academic support, interdisciplinary studies need strong and committed leaders to fuse young and established researchers into teams; teams that can provide identity and purpose. Such teams should have close working relationships providing ample opportunity for both formal and informal meetings and discussions. This implies close geographic location and I would strongly support current moves towards more flexible working bases and spaces in research institutes. Ideally, interdisciplinary work would bring together teams of disparate subjects to work closely together sharing literature, equipment, study sites and a common goal. We need to consider how we can provide the opportunity for near contact on a regular and informal basis to create the culture needed for interdisciplinarity.

5.4. Landscape as a unifying theme

Some subjects are also easier to study from an interdisciplinary approach than others. The difficult challenges do not come from mixing two separate branches of, e.g. chemistry, but of working with projects that cross between the humanities and natural sciences. Mixing chemistry and design, ecology and economy, archaeology and virtual reality, landscape metrics and landscape values could all involve a blend of qualitative and quantitative approaches. Landscape offers this challenge of working with mixed methodologies. It is the arena where conflicts are real and planning decisions made. We can easily observe the interplay between nature and culture at the landscape level. We are also forced to consider the relationships and trade-offs between many different functions when managing landscapes. This is reflected in the systems approach to landscape, an approach that reaches the highest level of integration attaining true transdisciplinarity (Tress and Tress, 2002).

5.5. Motivation and commitment

Motivation is essential to interdisciplinarity, as there are costs. It will take more effort to work together with a range of different subjects and additional time and financial resources need to be found. Discussions of the problems associated with interdisciplinary projects often focus on this aspect of requiring more time and financial resources (Naimen, 1999; Aunan and Fuglestvedt, 2000). However, the slower progress of much interdisciplinary research must not remain an excuse for failing to meet goals or provide research output. If we fall into that trap, there will not be many interdisciplinary projects in the future. Instead, we need to be realistic about time and resource budgets, start modestly by involving just a few institutes and subjects, and have a clear plan to include real deliverables. Large projects involving cross-institutional cooperation across many subjects are likely to fail. Researchers, in all the large projects I have assessed, admitted to problems in achieving a deep level of integration across subject boundaries. These projects mostly ended as a series of parallel studies trying to compare results obtained by different disciplines. For large-scale projects, there are just too many practical obstacles to overcome, especially when institutes are geographically distant and formal project meetings are the only contact between researchers.

There is one other factor that I have found of great importance in determining the success of interdisciplinary research and that is personal chemistry. If we ask people to work harder or in a different way, they have a right to ask what is in it for them. New research directions and ones that may provide solutions to landscape management problems may be highly motivating. Interdisciplinary work requires working together with others where results will be joint results and interpretation will be a joint effort. Working this closely together requires high levels of trust and respect. If the personal chemistry between participating researchers is not right, then some of the steps needed to achieve interdisciplinarity will become too difficult. Good chemistry helps teams overcome the many small differences and constant challenges in working with colleagues from different academic backgrounds. Keeping the project modest in size and ambition, at least at the start, helps. A co-ordinator that can mediate between project members and have the trust and respect of the team is also important.

5.6. When to start interdisciplinary studies

At what stage of a research project should we start interdisciplinary activities? The answer to this is very

simple—one starts at the beginning. If there is an advantage in interdisciplinarity for the topic being studied, it should be obvious. If it is not, then it is not worth fabricating the need; it will not work. From the very start of the planning process, achieving interdisciplinarity should be a goal with a clear plan and milestones. This contrasts sharply with many projects that leave the interdisciplinary part until the end and try to sew subjects together in some kind of disciplinary patchwork.

5.7. Developing quality criteria for interdisciplinary work

Although quality control in research has increased enormously in the past decade, especially in the university sector, there remains some uncertainty regarding the best way to assess interdisciplinary studies. In a recent edition of the Norwegian Research Council's information magazine Forskning (May 2000), an interview with the Vice Chancellor of the University of Trondheim (a centre supporting interdisciplinary studies) quoted her as saying that interdisciplinarity should be allowed to weight originality higher than disciplinary depth.

All subjects related to landscape research, whether in the social or natural sciences, humanities or arts are under increasing pressure to identify their research products and provide transparent quality criteria. There has been a long tradition of this in the natural sciences and significant activity in the humanities in recent years. Therefore, clear criteria now exist for assessing both qualitative and quantitative research approaches. Nevertheless, we can only identify clear criteria for judging the quality of the component parts involved in interdisciplinary research and have yet to reach general agreement on the products of interdisciplinarity and their assessment.

Assessment of interdisciplinary research, both at the stage of grant applications and as post-project appraisal, requires panels with members who have experience of interdisciplinarity. This is no longer a difficulty in the natural sciences where there has been an emphasis on funding interdisciplinary work, but remains less common in the arts and humanities. In developing sets of quality criteria, we must consider the wider aims of interdisciplinarity and that may require us to assess also its impact on society, ability to provide management solutions, develop new theory and to work across subject boundaries. In other words, we need to go back to the reasons for funding interdisciplinary research. Such an approach would also require subtle changes to the merit system such that co-authorship across disciplines would be weighted more highly as tangible evidence of successful co-operative research.

6. Can we identify a code of good practice for interdisciplinary landscape studies?

There are several points which appear common to projects that have achieved interdisciplinarity, these must be viewed as preliminary and are offered to promote discussion:

- there must be a clearly identified need for interdisciplinarity;
- if needed, then make interdisciplinarity a goal of the project;
- start the process of integration at the beginning of projects, NOT at the end;
- where appropriate, funding agencies should require plans for the integration process in project applications;
- do not be too ambitious—start with few disciplines and institutes;
- make special arrangements for students (e.g. interdisciplinary research schools);
- be aware of the power of personal chemistry;
- question the assumptions of one's own subject;
- be prepared to step outside the framework of one's own field;
- use shared goals and products to add glue to the joints between disciplines;
- learn about each other without prejudice and respect other disciplines and their approaches;
- examine the possibility to develop common theory;
- be aware of practical constraints (e.g. resource needs, geography);
- be aware of academic constraints (e.g. lack of methods and theory);
- share literature, study sites and problems;
- maintain regular contact, workshops and seminars (include in project methodology);
- accept that integrated studies may take more time, but plan for regular and realistic deliverables;

- support studies of the interdisciplinary research process (potentials and limitations);
- develop quality criteria and use appropriate assessment panels for interdisciplinary studies;
- reward quality in integrated studies.

It may be some time before the culture and merit systems, in research institutes and universities fully appreciate the contribution of interdisciplinary research, but there are many signs of progress. There are also clear signs of commitment by research funding bodies. It is now up to all those involved in interdisciplinary studies to demonstrate that the approach can produce innovative and original solutions to the management of multifunctional landscapes.

Acknowledgements

Work on interdisciplinarity is currently funded by the Norwegian Research Council (Grant 131422/720) NINA and the Swedish University of Agricultural Sciences. I thank my current and past research students for their commitment to interdisciplinarity and contributions to the debate. My special thanks go to colleagues Gro Jerpåsen, Anne Katrine Geelmuyden and Roland Gustavsson for their insights into landscape concepts.

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