

The Fire-fighter's Law: a conceptual tool to include nature conservation in on-farm planning

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Abstract

20 *The interface between agriculture and nature conservation is undertaken mainly by two regulations in the EU. The Common Agricultural Policy including agri-environmental schemes regulates environmental assets in the agrarian landscape and the Natura 2000 network and Habitats Directive protects areas of special conservation interest. Agri-environmental policies are being designed and implemented differently among EU-*

25 *countries and planning at farm level to accomplish the intentions in the regulations have been carried out to various degrees.*

The development of a new Danish concept for design and implementation of nature conservation plans at the farm level is outlined and preliminary results are used to discuss the advantages and drawbacks of the concept. The approach is based on the integration of

30 *conservation priorities into farming practices through the 'Firefighter's Law' as a metaphor for communication with the farmer. Priorities for on-farm nature considerations should be akin to the logic of a Firefighter's priority list arriving at the scene of a fire: preservation, protection, restoration and construction of new habitats and landscape elements.*

Preliminary results from testing the concept show that it is possible to combine this approach

35 *with farmer's traditional 'entrepreneurial' approach, resulting in balanced and feasible solutions. However, the voluntary implementation of the recommendation is a major drawback for the present implementation of the concept. The habitat and landscape effects of Farm Nature Conservation Plans need to be monitored and evaluated and principles for this are outlined.*

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Key words: Agri-Environmental Schemes, Agenda 2000, Natura 2000, biodiversity, conservation, farm-level planning.

Introduction

Agricultural production versus nature conservation is a classic conflict dating back
45 two centuries, when cities in industrialised societies developed and significant parts of
the population became detached from the agricultural production system. The
'Naturalist' View of nature, where nature is as wild and uncontrolled as possible and
should be left untouched, evolved and slowly started to play a role in political debate
at the beginning of the 20th century. Still, however, the 'Culturist' View, where nature
50 is something neat and tidy that can be constructed and should be controlled by man,
dominated the political agenda through most of the 20th century (Holten-Andersen et
al., 2000; Tybirk et al., 2004). However, during the last two decades a new view has
emerged, the 'Ecologist' View of nature (often characteristic of organic farmers),
where man is seen as an integrated part of nature who must co-operate with and
55 integrate nature concerns into the production systems (Alrøe and Kristensen, 2003).
Traditionally, the Culturist View has dominated agricultural and forestry practice,
while the Naturalist View has dominated the nature conservation regulations.
However, current regulations and international recommendations reflect society's
development towards a more integrative view – the Ecologist View. This view, which
60 also was the view of the so-called Brundtland report on sustainable development,
considers production systems that cannot be separated from nature, and that nature
should be considered as an integrated partner for production instead of a hindrance for
agricultural production (World Commission 1987, Tybirk et al., 2004).

65 Regulation of the interface between agriculture and nature conservation in the EU

In the European Union, the potential conflict between production of food (Culturist
View) and protection of the dwindling nature resources (Naturalist View) has been
regulated by two major initiatives.

The Common Agricultural Policy (CAP) was initially created to regulate markets, but
70 has undergone several revisions partly with the aim of preparing the agricultural
sector for diversification (Ilbery and Bowler, 1998). Agri-Environmental Schemes
(AES) were introduced in the 1980's as a separate policy accompanying the CAP
(Baldock and Lowe, 1996) and became mandatory for member states by reg. EC
2078/92. The implementation of AES varies considerably between member states.

75 The success of - and problems with - Regulation 2078/92 have been addressed in a number of national and international evaluations (Ovenden et al., 1998; Brouwer and Lowe, 1998; Buller et al., 2000; Wilson and Hart, 2000; Busck et al., 2001; Primdahl et al., 2003, Marggraf, 2003; Priorr, 2003; Kleijn et al. 2004).

The Agenda 2000 revision of the CAP includes national Rural Development
80 Programmes as the second pillar. Agenda 2000 views agricultural production as but one of several considerations to ensure the development in agricultural areas. It includes social, educational and environmental aspects, and using the principle of cross-compliance for environmentally friendly agriculture. The principle of cross-compliance has been reinforced in the revised agricultural policy approved in 2003
85 where compliance with EU environmental directives and so-called 'good agricultural standards' are required as a condition for payments (CEC, 2004).

Agenda 2000 and Regulation (EC) no. 746/96 require that member states are obliged to monitor and evaluate the effects of agri-environmental programmes to ascertain the environmental and socio-economic impact (Marggraf, 2003).

90 The Habitats Directive (92/43/EØF) mainly regulates the protection of ecosystems and species in the EU. Built on several earlier regulations, The EU Habitat Directive is considered to be the cornerstone of EU nature protection policies. For species and habitats of special nature conservation interest the member states are obliged to prepare management plans and applying additional nature conservation efforts in
95 order to fulfil the Directive (William, 1996).

The Natura 2000 network (European Commission, 2000) consists of designated areas of community interest and areas of special nature conservation interest, already included in the Habitats Directive. Areas of community interest (e.g. more common place nature with less need for specific conservation effort) would need other
100 measures than provided by the Habitats Directive to safeguard their nature values.

This is where the Agri-Environmental Schemes (AES) may play an important role. AES may be used in some Natura 2000 designated areas, but focus is outside Natura 2000 areas.

Some countries have not yet been able to detect positive biological effects of AES on
105 targeted species (Kleijn et al., 2001) whereas others have seen a positive impact (Carey, 2001; Stoate and Parish, 2001). Other countries, have not yet established an effective system for monitoring such effects and indeed practical and efficient tools

for assessment need to be developed (Brabrant et al., 2003). An analytical framework for addressing the effects of AES is presented by Primdahl et al. (2003).

110 Regulation at farm level

Seen together, the EU regulations in Natura 2000 and Agenda 2000 provide a new policy framework for planning at national and regional levels, but there is still a large gap between the overall regional objectives and the farm level. One regulation may seek to optimise nutrient balance; another, bird habitat protection; and a third
115 regulation may focus on farmers' education. There is rarely a co-ordinated approach at the farm level. Whole farm management and local conditions should be the starting point for implementation of AES (Schramek et al., 1999).

Farm level planning concepts have been developed in several countries such as Sweden, The Netherlands, Ireland, Germany and England (Busck et al. 2001; Olsen,
120 2002). The methods applied are rather different and reflect national trends in the focus (e.g. Jordbruksverket, 2003; Smeding and Joenje, 1999; Emerson and Gillmor, 1999; Oppermann, 2003). For example, the Irish Rural Environmental Protection Scheme (REPS) is a rather broad-based rural income support scheme mainly for small and medium sized farms encompassing aspects of nature conservation, nutrient leaching,
125 landscape, cultural and historical elements (Emerson and Egdell, 1999; Emerson and Gillmor, 1999). In Sweden, a plan has been offered to farmers concerning conservation of natural and cultural values on farms with specific goals for future biodiversity and landscape management (Jordbruksverket, 2000). The Dutch approach has been a landscape ecology-based planning method including a balance between on-
130 farm and landscape levels of biodiversity conservation. At farm level, four keynotes are identified: surface area, connectivity, variation and habitat quality. The method contains many relative specific recommendations for the intensively used Dutch agricultural landscape (Smeding and Joenje, 1999).

Danish regulations of interface between production and conservation

135 Since the mid-1980's Danish regulation of agricultural production and protection of environmental values has focused less towards the protection of terrestrial biodiversity and the cultural/historical values of landscapes. A total of 25 different voluntary measures exist to regulate the interaction of farming and environmental protection, but no co-ordination of measures at farm-level exists (SNS, 2003).

140 The Danish implementation of Regulation 2078/92 comprises a number of voluntary
regulations of 5, 10 or 20 years' duration, termed Environmentally Friendly Farming
principles (MVJ), aimed mainly at reducing the leaching of nitrate to ground and
surface waters. These vertical measures are directed towards designated
environmentally sensitive areas (SFL) areas. However, many Danish farmers do not
145 know about the specific designations or protected areas on their own land, revealing a
significant need for communication with farmers on the issue (Primdahl &
Christensen 2002).

Denmark has designated 8.4% of its land area for inclusion in the European Green
Network (Natura 2000). This includes many agricultural (24% of designated areas)
150 and semi-natural areas. Implementation of on-farm nature planning has been
recommended to ensure better integration of agri-environmental measures and nature
conservation (Wilhelm-udvalget, 2001).

Green Accounts was introduced in 2001 as such a farm-level planning tool (DFFE,
2001) to help farmers calculating specific farm-based balances for the use of nutrients,
155 pesticides, water and energy. The Organic Farmers Association has developed a
specific Farm Development Plan offered to organic farmers that can be combined
with Green Accounts (Økologisk Landsforening, 2004). Neither of these approaches
has been very successful in terms of number of plans implemented. The need to
develop a new concept to co-ordinate and communicate with the farmer the
160 restrictions and potentials for his particular farm that are embedded in the 25
voluntary Danish regulations is obvious.

The aim of the present paper is to present a concept for communication between
farmers and society to integrate the Naturalist and the Culturist View in a multi-
functional landscape. Preliminary results of a trial of the concept are shown and
165 discussed in relation to the general intentions of Agenda 2000 and Natura 2000 with
locally adapted measures. Finally, future development potential is discussed in
relation to monitoring and evaluation of the results of farm planning.

Methods

The methods used for development of the concept of Farm Nature Conservation Plans
170 (FNCP) had three stages: 1) a theoretical roundtable discussion among stakeholders
resulting in a concept, 2) a pilot field trial and 3) evaluation and refinement of concept
based on field experiences.

Concept development

175 Already in 1987, nature planning at the farm level was recommended by the National Forest and Nature Protection Agency (Agger et al., 1987), and a few local initiatives were carried out during the 1990s (Jørgensen, 2000; Holbeck et al., 2002).

Development of the present concept began in 2000, when a broad steering group was formed including the major stakeholders. The Forest and Nature Protection Agency asked the National Environmental Research Institute to chair the process.

180 Representatives on the counties, the Danish Agricultural Advisory Service, the Nature Council and specialists were invited to participate in developing a consensus concept. Five phases were identified for the planning process including the implementation of specific measures (Figure 1). The first three phases should be carried out as the immediate planning process, whereas the last two phases were left for a continuous
185 iterative process between the farmer and the extension worker to fulfil the intentions of the planning process. The focus of the desk-top concept was on the first three phases.

(Insert Figure 1)

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A major principle was that the planning process (step 1-3) needed at least both biological and agronomic expertise represented in the team to ensure communication of considerations for both production and conservation to the farmer. The county conservation officer and the agricultural extension worker would typically represent
195 these competencies. Another major principle was that during the field visit and 'kitchen table discussion', all major measures and plan elements should be agreed upon in a participatory dialogue. Without this agreement, the chances of implementing the plan would be low.

The voluntary participation by farmers in the process was a keystone for the
200 Agricultural Advisory Service. The basic idea was that the participatory dialogue between the motivated farmer, his family, 'his' agricultural extension worker and the county officer around the kitchen table during the field visit would be so inspiring that the implementation would be carried out without major obstacles.

205 Field Trials

Danish Agricultural Advisory Service was asked by the Forest and Nature Protection Agency to test the preliminary concept in close co-operation with the nature conservation expertise in the regional counties. One aim of the work was to keep the planning concept simple and fast and to minimise the cost. Thus, the total time spent by external consultants should be a maximum of 3-5 working days.

In 2001, the concept was tested in the counties of Aarhus, Ribe and Sønderjylland. The selected counties had participated in the concept development and offered personnel to participate in the trials. Farmers were attracted by advertisements in the local newspapers and approximately 50 farmers offered their farm for the trials.

215 Twelve farms were selected to represent all major categories of Danish farms, i.e. large pig production units, large dairy producers, small and large cash crop producers, medium sized mixed farming and organic farmers. Landscape type was another parameter used for selecting the farms. The field trial did not try to be representative of Danish farmers as such, merely to achieve various experiences to develop the concept.

220 The county officers and agricultural advisors (extension workers) were introduced to the process and prepared for the work in three local teams. The first three steps of the planning process (Figure 1) were carried out during spring and summer of 2001. Two of the 12 cases could not be carried out due to illness.

225 Concept evaluation and improvement

The farmers were asked to comment on the draft nature plans for their farms and evaluate the process through a questionnaire. Also the planning teams were asked to evaluate the process in a questionnaire. The steering group evaluated the process and the final report contained recommendation for future development (Holbeck 2002).

230 **Results**

Voluntary Farm Nature Conservation Plans (FNCPs) was presented as preliminary 'desk-top' concept inspired by experiences in the surrounding countries (Tybirk and Haugaard, 2001). The interest from farmer's associations and all other stakeholders was remarkably high at a final workshop to present and discuss the concept in November 2000.

Guiding principles – The Fire-fighter’s Law

The intention of nature planning is to balance the farmer’s long term family interest in discussions between the farmer and the local nature conservation authorities, facilitated by a mediator. Tools for communication was the most obvious need – to
240 bridge the gap between farmers and society’s interests.

These discussions should view the farm in a historical perspective in relation to the surrounding landscape, the agricultural development, and the changed nature conservation considerations in the area. In sum, the planning process should lead to a
245 balance between the different functions being considered in the particular landscape, such as production, aesthetics, nature protection, game hunting, shelter and other landscape functions.

The challenge of the FNCP is very often to balance the two classic views of nature; on the one hand the Culturist View and ‘entrepreneurial’ spirit of the farmer which has
250 dominated hitherto, and on the other hand the Naturalist View and ‘conservation’ spirit of nature conservationists/public nature administrators. It is always difficult to bridge the gap between these two basic views because they are founded deeply in personal conceptions of nature (Tybirk et al., 2004).

This conflict has led to the formulation of the ‘Fire-fighters Law’ based on the ideas
255 of Høgsberg (2001) and Reddersen et al. (1999) as a simple tool for communicating a basic guiding principle for nature conservation to farmers. Høgsberg (2001) proposed the principle applied in a broader sense to ensure nature qualities of a landscape including identification of the reasons for biodiversity degradations due to agricultural pressures (akin to a ‘fire’ in the metaphor) and a continuous monitoring of changes.

260 For Farm Nature Conservation Plans we reduced this broader principle into the more simple and clear ‘Fire-fighters Law’ as the backbone for the planning process.

The symbolic metaphor of a fire-fighter arriving at a (farm) fire is very edifying.

The fire-fighter’s priorities are:

- 265 1. Firstly, to save the most threatened building yet unaffected by the fire - akin to **preserving the highest nature quality spots** on farm. Almost at the same time the fire-fighter will
2. Start to reduce the impact of the fire by spraying water - akin to **protecting nature elements** by establishing buffer zones and conservation headlands. After controlling the fire it will be time to

270 3. Consider whether the buildings can be rebuilt - equivalent to considering whether
nature restoration by suitable management is possible or to

4. Plan the construction of a new building to replace the burnt - similar to **planning
new landscape elements** in relation to the existing local conditions to replace
habitats that have disappeared.

275 This principle should introduce conservation aspects into discussions on how to
protect and develop the natural potentials of farms. The intention is not to implement
the principle on all farms at all costs, but to begin with this basic nature conservation
principle and, through this enter a discussion on the values of what is old and wild,
versus what is new and controlled by the farmer. Typically, farmers will prefer to start
280 by constructing new nature (action-oriented with local perspective), whereas the
conservationist would start by conserving what is as yet unaffected (protection-
oriented with national or international perspective). These ends should meet in the
FNCP.

Another challenge for FNCP is the potentially differing interests of the owner (and
285 property management) and the producer (and agricultural management) in the case
where the land is leased. The pattern of ownership may in situations where land is
leased severely affect the outcome of a FNCP, since the owner is usually the
responsible person according to environmental regulations whereas the producer is the
one who affect the habitats. Therefore, the long-term aims of the plan cannot be
290 fulfilled without this merging of interests.

Field trial results

The field trials were kept almost within the planned time frame. Depending on the
size, complexity and the level of details in the plans the time spent by external
consultants were between 25 and 44 hours for each plan.

295 The quick survey of nature on the farm was found during the field trials to be
insufficient to detect all details, but gives the farmer and the planner an overview as a
starting point for a participatory trans-disciplinary discussion of aims, possibilities and
constraints. The focus in the ten plans was mainly at the farm level, but a FNCP must
be viewed in a larger landscape-planning context as well, always involving planning
300 and nature conservation authorities. All areas designated in Natura 2000 network and
the Danish Nature Protection Act as well as all other small uncultivated and field

biotopes should be included in the farm plan to be able to prioritise according to the Fire-fighter's Law.

305 The categories of the Fire-fighters Law were defined according to the practical
experiences. **Preservation** could often be non-actions for the farmer, but very
important new recognition of valuable nature elements on his farm. The existence of
at rare orchid or butterfly in a low productive dry grassland opened the eyes of the
farmer to become proud of this 'new' value of his farm. **Protection** could be
310 recommendations in the FNCP with the purpose of protection an existing biotope,
such as pesticide free headlands to protect hedges or a non-fertilised bufferzone to
reduce leaching of nitrate. Several Agri-Environmental measures are available for
such protective actions. **Suitable Management** was measures to keep or restore e.g. a
meadow from bush encroachment or the restoration of a contaminated pond. Some of
these measures can obtain financial support from the county. **Planning new**
315 **landscape elements** was typically planting of hedges, forests or establishment of a
pond for duck hunting. Some of these actions can also obtain financial support from
the county or the state.

A categorisation of the recommendations agreed upon in the 10 FNCPs revealed a
somewhat surprisingly high interest among the farmers for the first two
320 recommendations in the Fire-fighter's Law (Preserve and Protect, Figure 2). More
than half of the recommendations fell into these categories, whereas only 17 % of the
recommendations were classified as nature construction. Due to the few trials, these
results may only be taken as an indication of the possibility to change the focus from
nature construction to preservation and protection by means of information and
325 participatory dialogue.

(Insert Figure 2)

In any case, the recommendations must be implemented by the farmer and in most
330 cases information is provided on where to find more specific knowledge, e.g. at local
nature conservation authorities, the hedgerow advisory board, the hunters' association
etc.

Concept evaluation and revision

335 The farmers' motivation for participation was mainly to achieve a better overview of options and constraints for improving nature considerations on their specific farm. Several farmers were driven by an interest in game hunting, an interest shared by many Danish farmers, either as a personal passion or for the benefit of game hunting fees which play a significant role in some farm economies.

340 The motivation of the counties for participation was mainly to establish a positive dialogue with the farmers concerning the regional Agri-Environmental measures of opportunities and constraints on the specific farms.

Most of the farmers expressed satisfaction with the expert discussion and advice on nature considerations during the farm visit. Perhaps the most important achievement of the planning process was the increased motivation for valuing and conserving
345 existing nature elements on their farms. For example, the team could show a farmer that a patch of semi-natural grassland – perhaps of no specific (production) interest to the farmer prior to the visit - was the habitat of species of national or international interest. Such knowledge added new dimensions to the discussions on conserving old habitats, relatively unaffected by modern farming practices. On the other hand, if the
350 farmer wanted to include a new 5-row hedge with 10 different woody species for the future benefit of roe deer and other game this could also be included in the plan.

The farmers and the planning teams found that the Fire-fighter's Law proved to be an extremely valuable metaphor to reach the intended balance between the local action-oriented perspective typical of the farmer and the national or international
355 conservation orientation of the county officer.

The recommendations for the planning concepts were incorporated in an adjusted version (Tybirk & Holbech 2002), not differing fundamentally from the preliminary desk-top concept. A major recommendation was to establish an education for extension workers and county officers to improve the planning process and the
360 resulting FNCPs.

Discussion and recommendations

Some of the agri-environmental measures implemented in various EU member states under the CAP and Agenda 2000 may be considered successful. The national evaluations of the AES in countries such as Ireland and Sweden, with relatively high
365 proportions of low-intensity agriculture, shows that the measures have been quite

successful in terms of farmers' participation. In the UK and Denmark with high input farming and a strong emphasis on market measures, agri-environmental measures in general have been less successful (Olsen, 2002). It is believed that to obtain success, an on-farm planning methodology enabling the farmer's and the public interests to be combined in the best suitable way under the local conditions is necessary. The different national/regional/local AES have to be presented and explained to the farmer, and the subsidies involved should be appropriate.

The different measures reflect national priorities, and in Denmark the aquatic environment has been of great concern since the 1980's. This is reflected in the Danish CAP and Agenda 2000 measures focusing on nutrients and pesticide loss from agriculture with little attention paid to terrestrial biodiversity and conservation. However, the implementation of the Habitats Directive and Natura 2000 has promoted biodiversity and landscape conservation issues. In addition, the signals from CAP revisions have reinforced the need for farm-level planning initiatives to meet society's demand.

The results of the presented field trials suggest that it is possible to apply a concept that enables the advisors and planners to introduce conservation issues in farm-planning through the application of the Fire-fighter's Law. Knowledge on identity and conservation value of species and habitats encountered during farm visit are key elements to 'open the eyes' of the farmer and to make him acknowledge the rare and vulnerable species and ecosystems when present.

The conflict between conservation and entrepreneurial spirit of the farmers requires not only substantial and organisational integration (Primdahl et al., 2002) but should go one step further, requiring spatial integration to balance the various considerations at farm level. Open and direct participatory communication between farmer, nature conservationists and landscape planners should be developed to solve such trade-off problems. This implies a balancing of potentially conflicting interests in the landscape: the individual versus the society, the local versus the national. These conflicts have been obvious during the development of the concept, but we believe that it is sufficiently open to embrace and stimulate discussion at the farm level.

Although at first glance the 'Fire-fighter's Law' seems rather conservative and imposes many restrictions on farm and landscape development, the field trials have shown it to be a good communicative tool for understanding some of the opportunities and constraints in managing and conserving nature on farms. Of course, the voluntary

400 farmers selected for the field trials may have been more positive towards the ideas than average farmers, but the direct dialogue is certainly necessary for communicating the ideas and principles behind AES and other protection measures.

From 2003 onwards the Ministry of Food, Agriculture and Fisheries has initiated a pilot-scheme for demonstration of FNCP. The Fire-fighter's Law has been adopted
405 here and is presently being used in hundreds of FNCPs in the pilot scheme.

There is a considerable need in the Danish agricultural landscape to focus on the conservation of the few, small patches of long continuity and areas of low agricultural influence (Reddersen et al., 1999). When this can be combined with the farmers' wishes to construct new habitats for the benefit of locally important species (e.g.
410 hunting prey), the interests of the farmer and the rest of the society would coincide. One of the major advantages of the concept presented is that it is relatively fast and simple compared to the methodologies of other countries. The Swedish method requires less time for plan preparation whereas the Dutch is more thorough and detailed than the Danish model (Jordbruksverket, 2000; Smeding and Joenje, 1999). If
415 the process is too complicated and expensive, less use of the concept would be expected, but a certain level of plan quality is needed. The 'fast and simple' Swedish model has been used widely whereas the Dutch model has been used less extensively to date.

The 'special case' of organic farming representing the Ecologist View on nature
420 (Tybirk et al., 2004) may indeed also apply the presented concept without many modifications. Often it is believed that organic farmers care more for biodiversity and nature protection as compared to conventional farmers (Stolze et al., 2000). However, such difference has mainly been documented for the common place nature found in the fields or hedges (Aude et al., 2003) and does account for rare species or nature
425 types of greater conservation interests. The concept may attract attention to uncultivated farm areas not traditionally cared for in organic farming.

Evaluation of results of a FNCP

With the present pilot-scheme for demonstration of FNCP based on these principles, a tool for evaluation of expenditures will soon be needed. Several features make
430 evaluation of FCNP difficult and recent papers address this complicated challenge (Brabrant et al, 2003; Opperman, 2003; Primdahl et al., 2003).

The difficulties include time lag for biological effects of actions (ecological inertia, *sensu* Reddersen et al., 1999); unequivocal causality (policy is only one of several influencing factors) and comparability (with a non-FCNP situation), the interactions
435 of several measures, and the high costs of environmental monitoring. The effects of agricultural policies, protection as well as improvement effects, can be evaluated as a combination of immediate performance effects (uptake of agreements and change of agricultural practices), and derived ecological effects (outcomes) of farming practice on the environment (Primdahl et al., 2003).

440 We propose that effects of FNCP should be evaluated from at least three different perspectives. Based on descriptions of the pre-FNCP situation, *ex post* evaluations of the performance effects can be carried out a few years (3-10) after the start of the process, whereas ecological outcomes may not be appropriately evaluated until 10 or more years after. Effective monitoring requires specific success criteria and
445 appropriate indicators for evaluation, namely:

1. Specific actions carried out by the farmer,
2. The farmer's nature conservation interests/ understanding, including changes of farm management practices and
3. Documented (biological/ecological) outcomes at various scales (species, habitats,
450 and landscapes).

The farmer's actions may be evaluated by farm visits (interviews) and aerial photos. Major indicators could be the percentage of actions recommended in the FNCP having been carried out, perhaps separated into the four Fire-fighter's Law categories (preservation, protection, restoration and construction).

455 The second category of indicators related to the farmer's appreciation of nature is more difficult and evaluation results may vary with the type of farmer in question. It would involve interviews before and after the planning process and could include evaluations of the farmer's perception of nature and how nature is included in the farmer's arguments. Here, specific or general educational measures as part of the
460 planning process may affect the farmers' attitude. In addition, more specific conservation-oriented farming actions, such as care with pesticides and fertilisers in relation to sensitive nature elements, should be considered. Another aspect could be the farmer's own observations of nature elements on his farm (as proposed by Opperman 2003), such as nesting birds or partridge chicks observed over the years.

465 However, more work on indicators is needed for this type of evaluation.

The biological outcomes are perhaps the most difficult to evaluate and at least two scales are of relevance here. The connectedness or fragmentation of habitats at the landscape level is of importance for a number of relatively common mobile animal species, such as birds, butterflies and many mammals. Specific indicators at farm-
470 level with documented effects for wildlife species may be needed to evaluate effects at this scale – depending on the size of the farm. The indicators should be able to measure structural changes from years 1 to 10 at the farm/landscape of relevance for wildlife.

The evaluation of changes of presence of habitats is rather straightforward
475 (registration of increase or decrease on air photos). Biologically, however, the evaluation of changes in plant and animal populations at the habitat and landscape level is more interesting, but is extremely difficult, as populations often fluctuate in time. A specific monitoring programme has to be designed and repeated inventories need to be completed to be able to evaluate such effects.

480 However, biotope specific plant communities can be recorded relatively quickly on selected farms before and e.g. 3 and 10 years after the FCNP has been produced. Effects of e.g. absence of pesticide drift in organic farming has been documented after 10-15 years and new data suggest that already after 3-4 years such changes can be detected in hedges (Aude et al., 2003; Petersen et al., 2004). A plant species list for a
485 selected biotope type (e.g. a hedge) could, by simple passive modelling, be incorporated in a multivariate ordination diagram of all Danish hedge vegetation plots, where major plant distribution parameters are known (Tybirk et al., 2001). Changes in the plant community over the years could indicate within 5-10 years whether the plant community is changing due to the measures taken by the farmer.
490 This requires that farming is the major pressure and that the measures implemented reduces this pressure significantly.

The Achilles heels

The quick and cheap concept recommended has shown great potentials to be adopted and widespread in the pilot demonstration scheme by the Ministry of Food,
495 Agriculture and Fisheries. However, the evaluation of the field trial indicated that the concept will suffer from lack of ability to detect and integrate all valuable nature elements. The level of knowledge of the advisor and regional county authorities is crucial to detect rare and protected species and habitats.

A major limitation seen from the conservationists is the voluntary aspect of the FNCP, although this is probably crucial for farmer's interest in the plans. It is at present exclusively the farmer's choice how and when to implement the suggested activities in the plan although the mediator will follow-up after the planning process has finished. One example is a farmer, where an explicit recommendation in the FNCP was to preserve and protect an old hedge crossing his fields, but two years later the hedge had been removed. At present, no instruments are available to ensure that the recommendations have any legal authority, but in other subsidised measures, e.g. hedge planting, the existence of the hedge 10 years later is controlled and sanctions are taken if it has been removed. It is believed that the subsidies now being paid to the pilot scheme on FNCP will reveal the strong need for instruments to control the outcome of the society's investment in on-farm nature conservation. One way to solve this problem of 'value for the money' would be to integrate the plan in incentive schemes such as agri-environmental schemes under the CAP. However, a more radical and in some ways also more logical solution would be to make a plan a precondition for any subsidies from CAP. In this way the plan could also ensure that the cross compliance requirements are fulfilled.

Another drawback is that neither authorisation system nor educational background for the mediator in the planning process has yet been defined. The steering committee behind the concept has only defined the requirements as 'biological and agronomic' expertise, which is too unspecific. An educational programme for mediators has been established.

Other considerations than biodiversity

The concept is focused largely on introducing biological conservation considerations into farming systems, without imposing many constraints on production. Less emphasis has been placed on landscape considerations, compared to the Dutch methodology (Smeding and Joenje, 1999), although many intentions are similar. The Swedish approach has more focus on cultural and historical values in the landscape (Jordbrugsverket, 2000) and we believe that in the future these aspects could further improve the Danish approach described in the previous sections.

It is obvious that education of farmers could also help to improve the results and should become an integrated part of a FNCP. In addition, more controversial aspects, such as public access could be dealt with.

However, as a starting point to keep costs and time consumption for the farmers at realistic levels, these aspects play a relatively modest part of a FNCP, although the protocol allows for putting more weight into such aspects.

535 Used in the optimal way another benefit of the Danish concept presented here is that planning authorities, nature conservation authorities and farmers can meet in an open dialogue mediated by the agricultural extension service. The FNCP should not be seen as a detailed planning document, a legal instrument or a manual for the farmer; rather, it should be perceived as a process enabling the balancing of production, nature
540 protection and landscape aesthetics in farm management decisions.

Recommendations

At present, the Danish pilot scheme exist only to demonstrate the potentials of the FNCP, but a future permanent FNCP measure could become mandatory for AES participation. Furthermore, the demand for implementation requirements (e.g.
545 percentage of proposed actions in the plan implemented by the farmer) and evaluation of effects should become an integrated part of such a new scheme.

The symbolic rescue action could be extended to include an early warning system to detect the fire (monitoring of biodiversity changes in the agricultural landscape) involving the farmers – or even to educate farmers to prevent the fire from starting
550 (Høgsberg 2001).

In the longer run, the FNCP should embrace all specific AES where relevant, and the idea of collective nature conservation plans for several farms within a local landscape is currently being developed. FNCP's (individual and collective) could be given higher incentives if including Natura 2000 designated areas and when combined with
555 Green Accounts.

The result would be a rather holistic (but possibly more costly and complicated) concept of evaluating the effect of farming systems on nature conservation for species and habitats, landscape aesthetics and function (nutrient, pesticide and energy management), and cultural history of the landscape. This would meet many of the
560 intentions of Agenda 2000 and Natura 2000 and could become a practical concept towards sustainable and multifunctional agriculture.

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Figures

695 Figure 1.

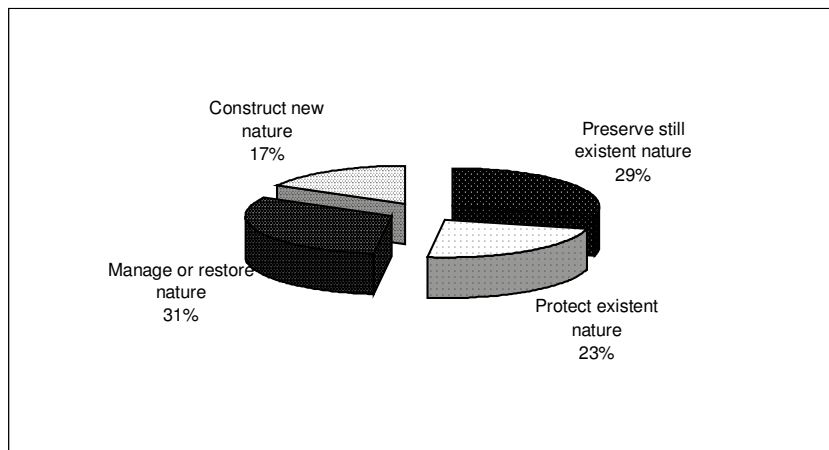
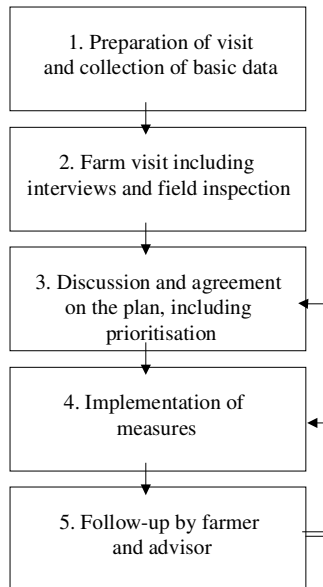


Figure 2

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Figure captions

Figure 1. Farm Nature Conservation Planning diagram

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Figure 2. Types of recommendations from 10 Danish Farm Nature Conservation Plans (Holbeck, 2002). Legend: **Preserve** covers e.g. preservation of old hedges, semi-natural grasslands, natural regeneration in farm-forest patches. **Protect** covers e.g. set aside along streams, hedges, conservation headlands, ensuring of landscape connectivity. **Management/**

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restoration covers e.g. clearing of bush encroachment, suitable grazing, management of hedges, clearing of pond, re-meandering of stream. **Construct** covers e.g. new wildlife plantation, establishment of pond, forest plantation

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