Nature management and livelihood strategies on Danish organic farms

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Introduction

Societal demands to the farming sector are changing, from solely focusing on food-production to an increased interest in the production of environmental and nature values, as well as a socio-economically sustainable countryside. Parallel to this development agricultural restructuring takes place. The modernisation paradigm builds on scale enlargement and intensification and a large part of the agricultural sector still follows this development path. Mainstream development in Denmark and other intensively cultivated countries implies a strong structural development with fewer and larger full-time farms and a decrease in small-scale farming (Ministry of Food, Agriculture and Fisheries, 1998). Various alternative pathways to farm development have been identified (Ilbery and Bowler, 1998), including diversification of activities and use of human resources for income-generation. These pathways often express alternative development choices than farm intensification (Djurfeldt and Waldenstrom, 1999). A crucial question is thus, if some of these alternative developments may be more suited to deliver those multifunctional values demanded, than the main-stream developing farms are – and may be eligible to more attention from the policy-side.

Organic agriculture has been identified as one of these pathways forming the agricultural restructuring (Ilbery, 1992). Organic agriculture represents a whole-farm approach to natural resource management, aiming for an integration of production goals, environmental goals and goals for nature management and protection. Subsidies to organic agriculture are mainly justified with the benefits for environment, nature and landscape, and OECD uses organic farming as one of the whole-farm agri-environmental indicators (OECD, 2001). Common for all types of organic agriculture is the aim to achieve a farming system, which has a closed cycle in nutrients, i.e. striving for self-sufficiency on farm or local level and minimising nutrient loss to the environment. Another common goal is that biodiversity in farmland and adjacent areas must not be compromised (IFOAM, 2003). However the ways these common goals manifest themselves in the practice of organic farming in different socio-economic and biophysical contexts are quite varied, and it is thus interesting if the label of organic farming cover a wide variety of nature impacts.

We explore the variation in nature management on organic farms in Denmark. Farming practices in organic farming are strictly regulated, both directly through the organic standards and indirectly through constraints imposed by the organic standards. Organic farms therefore offer the possibility of focusing on a segment of farms where certain farming practices are known. Our starting point is, that when farm households choose alternative development pathways like diversifying the income sources, directing time and resources to off-farm work or other on-farm activities, it has potential impacts on the proportion and management of uncultivated and extensively used areas on the farm, stemming from changes in farm practise and allocation of resources. Therefore, we want to move the focus from the farming system to the decision-level, i.e. the farm household, and explore whether using the concept of

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livelihood strategy can supplement existing farm and farmer typologies, especially in relation to the interaction between production and nature. In this paper we describe and analyse how nature management on the farm may be related to the more traditional farm categorisations like farm type and size and regional context as well as to components of their livelihood strategy on a large sample of the existing organic farms in Denmark.

Landscape elements and permanent grassland as measures of nature management

In an intensively cultivated land as Denmark (62% of the total land area is agriculture, of which only 7% is permanent grassland and the rest is in rotation) the potential for nature quality in the landscape is to a large extent related to the agricultural land use and management. In the absence of larger uncultivated areas, landscape elements (hedgerows, woodlots, ponds, etc.) and extensively managed grassland often constitute the principal potential for biodiversity in the farmed landscape. Extensively managed permanent grasslands harbour 15% of the red-listed plant species and more than 50% of the Danish day butterfly species (Stolze and Pihl, 1998). Maintaining grasslands requires utilisation like grazing or cutting, and the link between nature conservation value, i.e. living conditions for wild flora and fauna, and management intensity of a given grassland is well documented (Alard et al., 1994; di Guilio et al., 2001; Ejrnæs and Bruun, 1995; Hald, 2003; Kruess and Tscharntke, 2002; Stolze and Pihl, 1998). Therefore, the farmer's short and long term management of owned and rented land is relevant to the development of quality landscape elements. This is both in terms of non-removal, securing elements with a long continuity, in terms of new planting, adding to the total area of elements and increasing density as well as the management intensity and maintenance (grazing/mowing) of permanent grasslands. Moreover it has been suggested that biodiversity in agroecosystems depend on both landscape and farm management, and that investigations of relationships between farm management and biodiversity should take landscape context into consideration (Weibull et al., 2003).

We use the concept of farm nature management for actions, resulting from farm household decisions that are assumed to influence nature content on the farm. This involves both decisions mainly linked to the agricultural production (e.g. crop distribution and management, removal of hedges for rationalization purposes, management intensity of permanent grassland, etc.) and decisions mainly made for other reasons (e.g. protection or creation of hedgerows, woodlots or ponds for hunting, aesthetic or nature interests).

Livelihood strategies of rural households

Diversity in income sources of rural households is a general pattern for the intensively cultivated farming sector over most of Europe (de Vries, 1993; Djurfeldt and Waldenstrom, 1999; Hill, 1999; Jervell, 1999), and it has been a growing phenomenon during several decades (Kinsella et al., 2000; McNally, 2001). Evans and Ilbery (1993) suggested that a distinction between farm-based diversification and off-farm employment provided a beneficial focus for empirical work, and subsequently several studies have highlighted the importance of a focus on the household as decision-making entity – also for farm management decisions. (Gorman et al., 2001) use the framework of farm household strategies to point at diversification as a means to expand the pool of livelihood assets from which the family's livelihood is constructed.

A few studies have directly explored the relationship between livelihood strategies and nature management on the farm and have documented e.g. differences in hedgerow planting related to farmer

occupation (Primdahl, 1999). Battershill and Gilg (1997) state in an investigation of the preconditions for environmentally friendly farming in the Southwest of England that non-agricultural farm income as well as off-farm income were often crucial for the survival of environmentally friendly farm practises. In a study of pluriactivity, farm household socio-economics and characteristics of grass fields in Scotland, (Ellis et al., 1999) concludes that involvement in off-farm activities influence the type and intensity of land management to the benefit of botanical values on grassland.

The present paper thus raises the following questions:

- How does nature management vary on organic farms in Denmark, and
- To what extent can various components of livelihood strategies assist in understanding this variation in nature management?

Data and methods

Data were retrieved from registry on land use of organic farmers (Danish Plant Directorate, 2001) in combination with a quantitative survey consisting of personal interviews with 347 organic farmers with a total utilized area of 20 288 ha and constituting app. 10% of the organic farms. Interviews concerned the farming enterprise, other on- and off-farm activities, management of permanent grassland and fields in rotation, quantity of uncultivated areas on the farm and land use changes within the last 5 years. Farmers were located in eleven case areas all over the country with the aim of including regional variation in broad landscape types and farm types. In order to obtain variation over a broad range of parameters, we aimed at interviewing all organic farmers in each case area, constituting 25-40 farmers pr area.

Nature management on the farms were described with quantity and quality of landscape elements and permanent grassland on the farm. Landscape elements less than 1 ha was anticipated not to have a major economic importance (e.g. as forestry) Their presence results from decisions related to farm lay-out – either in terms of optimisation of field management (uncultivated field corners, slopes, windbreaks, etc) or directly as decisions to establish wildlife habitats, including ponds. Larger bogs and forests/wilderness on the farm area were excluded from this analysis, as they are considered not to belong to the management of the agricultural area. Quality aspects were explored using age of landscape elements, and age and management intensity of permanent grassland.

The interviewed farmers were asked to identify uncultivated areas on a map covering the farm area. Density of landscape elements was calculated based on farmers' information on hedgerow length and number of rows, area of woodlots, length of dikes, and number of ponds and grave mounds. In hedgerows mean row width was assumed to be 1,25 m, and each pond and grave-mound was assigned an area of 400 m2. Density of both landscape elements and permanent grassland was calculated based on total field area rather than farm area, aiming at a description of farmland density.

Density of landscape elements is classified into 4 density classes, and frequency tables explore the simple relationship between each of the biotope types and farm characteristics. Table 1 presents the classes including the total density of landscape elements, calculated from the sum of the three areas pr farm. The density classes approximately follow the quartiles.

Table 1. Landscape element density classes

Element type	Linear (area)	Point (area)	Area	Total area
Class 1	0-40	0	0	0-130
Class 2	41-100	1-12	1-50	131-240
Class 3	101-190	13-40	50-215	241-450
Class 4	>190	>40	>215	>450

Quantity of permanent grassland was calculated based on the total utilized farm area. Management of permanent grassland on the 666 permanent grassland fields were described using grassland age (years since last ploughing), farmer's plans for resowing or ploughing, main use (grazing, cutting, combined, abandoned), nutrient inputs (manure). Fields were classified as being abandoned, extensively managed (no fertilizer and no plans for reploughing/resowing) or intensively managed (fertilized and/or plans for reploughing/resowing).

Farms were classified in three categories ("PG High/old", "PG Medium", "PG Low/young") based on a combination of the percent area of permanent grassland and the proportion of grassland older than 40 years. "PG High/old" are farms with either more than 5% permanent grassland, all of which is older than 40 years, more than 10% permanent grassland of which more than half is old, or more than 25% permanent grassland of which some is old. "PG Medium" are farms with up to 25% permanent grass, of which less than half is old, with up to 10% grassland of which more than half is old or with less than 5% grassland, all old. "PG Low/young" are farms with permanent grassland, all younger than 40 years.

For the exploration of livelihood components farmers were asked about the off-farm income, for themselves as well as for their spouses. Moreover if they had any non-agricultural farm activities on their farm, such as direct sale of farm products, farm based tourism, windmills, renting out of buildings, handicraft etc., and if yes, how important these activities were for their economy.

In addition to region, i.e. landscape context, and farm size, three types of farm categorisations were constructed for the analysis:

- Traditional farm types i.e. farm specialisation based on economic importance of the production branches on the farm (dairy farms, etc.)
- Farms with varying number and economic importance of non-agricultural farm activities
- Farms with varying degrees of off-farm income from farmer and spouse respectively. The latter aspect was additionally explored with the variable "farmer type" based on farmer's own perception of his status as full time, part time, hobby farmer etc.

The household level of off-farm income was classified according to increasing levels based on both farmer and spouse activity. The classification is presented in table 2:

Table 2. Household off-farm income levels on organic farms

	Farmer's off farm income	Spouse's off farm work
A	Major income	Full or part time**
B	Major income Minor income	Minor* Full time
C	Minor income*	Part time or minor
D	No income	Full or Part time
E	No income	No income

*Minor is less than 20 hours/week (spouse) and less than 50% of income for farmer.
**Part time is 20-37 hours a week for spouse

Table 3. Farm, household and farmer variables and the acronyms used

Variable	Acronym	Number of classes	Class names
Farm type	BT	4	Small, plant, mixed, dairy,
Size of farm	Size	6	< 10 ha, 10-20 ha, 20-30 ha, 30-50 ha, 50-100 ha, >100 ha
Region	REG	5	Regions 1 to 5, see table 4.
Farmer type	FT	3	Full-time, part-time, hobby/other
Off-farm income	PLUR	5	A,B,C,D,E – explanation in table 2 above
Non-agricultural farm activites	NAFA	3	0 (no activities), 1 (one or more activities of no or some economic importance, 2 (one or more activities of some or considerable economic importance

The eleven case areas were combined to 5 regions related to broad landscape types. They are unfortunately of very different size as the original case areas were selected so to cover both a range of landscape types and other parameters. The regions are presented in table 4.

Table 4. The landscape content in the regions

	Number farms	Landscape description	Major soil types
Region 1	129	Heathland: outwash plain and old moraine	Coarse sandy soils
Region 2	68	River valley in young moraine	Sandy clay and clayey sand
Region 3	76	Young moraine	Sandy clay and clayey sand
Region 4	35	Dominantly Yoldia and litorina, some young moraine	Fine sandy soils
Region 5	38	Young moraine – coastal landscape	Clayey sand

The simple relationships between individual farm variables and density of landscape elements or share of permanent grassland were analysed by chi-square tests of frequency tables.

Results

Livelihood components on the farms

We start by looking at the farmers' off-farm income levels. More than half (54%) of the farmers derive their main income from off-farm work and 26% have no off-farm income at all. However, 41% consider themselves as full-time farmers, thus including the major share of those, who have minor off-farm incomes, but also to a smaller extent those, who have major off-farm incomes. 71% of the spouses work full- or part-time outside farm, and this has an influence on the way that the farmer perceives himself. Thus if both the farmer and the spouse work most of their time off-farm, only 5 farmers consider themselves a full-time farmer. If the farmer works mainly off-farm, but the spouse has only minor off-farm incomes, 20 farmers consider themselves full-time farmers.

Looking at the household off-farm income levels very few (8%) of the interviewed farm households had no off-farm income from either farmer or spouse (class E), and 12% had only minor income (C). In 42% of the farm households both the income of the farmer and wife was mainly derived from off-farm work (A). Farms with major off-farm incomes were considerably smaller than the farms where the household had only minor or no off-farm income, but other conclusions on relationships to farm size cannot be made, as variation in farm size within groups is high.

Table 5. Household income types on organic farms

	Farmer's off farm income	Spouse's off farm work	*Number of farms*	*% of farms*	*Mean farm size, ha*
A	Major income	Full or part time	147	42	25
B	Major income Minor income	Minor Full time	66	19	47
C	Minor income	Part time or minor	42	12	76
D	No income	Full or Part time	63	18	83
E	No income	No income	27	8	90

Half of the farms were engaged in non-agricultural activities on their farms, and 15% are engaged in more than one activity (table 6). While 21% of the farmers state that these activities are of some or major economic importance, there is still a high degree of farmers having non-agricultural activities on their farm, which are judged as having no or minor economic importance (27%).

Table 6. Number and economic importance of non agricultural activities (NAFA). % of farms.

Non agricultural activities, no.		Economic importance				
		No	Minor	Some	Major	Total
No activities	50,7					50,7
One activity		12,9	8,4	6,3	5,8	33,4
2 or more activities		1,4	4,6	3,4	5,4	14,8

Quantity of landscape elements and permanent grassland

On the 346 organic farms, linear landscape elements were present on 89% of the farms, while point and area elements each were present on 2/3 of the farms. Based on the total area of utilized land and the total area of landscape elements less than 1 ha on all farms, the overall density of landscape elements was 2,3%. Based on farm densities, the average area density of landscape elements on farms with elements was 3.9%. 13 farms had no landscape elements.

Table 7 Length, number and area of types of landscape elements on 346 organic farms

Landscape elements	N *)	Mean length / number / area per farm	Mean length / number / area / ha	Mean estimated area density, m2/ha
Linear (hedgerows, banks)	308	2221 m	58 m/ha	146 m^2/ha
Point (ponds/grave mounds	235	2,6	0,13/ha	46 m^2/ha
Area (woodlots etc.) <1ha	232	8800 m^2	234 m^2	234 m^2/ha

*) Farms without landscape element type excluded

The area of linear landscape elements contributes with 43% of the total area of landscape elements, with 7% of the length of linear elements constituted by earth banks and stonewalls. The point landscape elements, ponds and grave mounds, contribute with approximately 6% to the total area. The grave mounds constitute 22% of the number of point elements. Area landscape elements include woodlots, small uncultivated areas, wet areas with shrubs and the like. Mean densities are seen in table 7. Frequency tables of landscape element classes versus farm variables were analysed and the significance levels are presented in table 8.

Table .8 Significant relationships between farm variables and landscape element densities

Variable	Linear	Point	Area	Total area
BT	***	***	***	***
Size	***	***	***	***
REG	***	***	(NS)	NS
FT	**	***	**	***
PLUR	**	***	NS	**
NAFA	NS	NS	NS	NS

Linear landscape elements are significantly related to most farm variables as illustrated in table 8. High densities of linear elements are especially related to landscape type, where the Region 1 has the highest density (md.= mean density 67 m/ha) and Region 2 the lowest. Among farm sizes, small farms have the highest densities (md. 107 m/ha) – almost three times as dense as on the largest farms. Hobby farmers have a significantly higher density than the other groups of farmers, which are alike, and among the farm types dairy farms have the highest density (md. 88 m/ha). Farms with a high income from off-farm work (Class A: highest off-farm) has the highest density (md. 67 m/ha). Figure 1 shows the relationship between density of linear elements and landscape context.

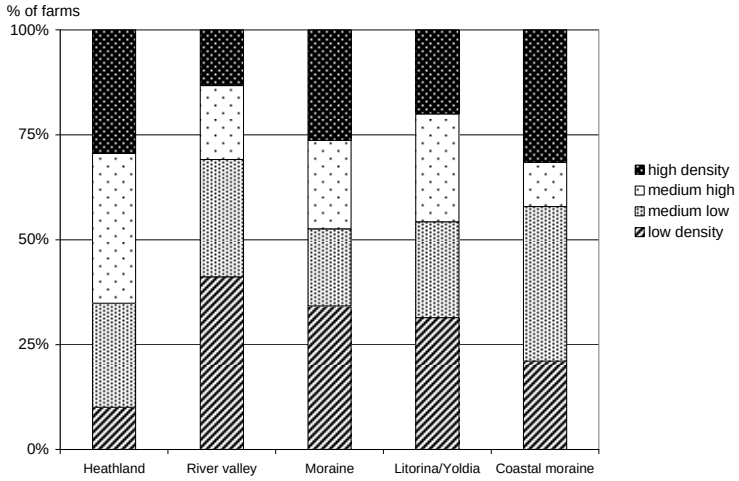

Figure 1. Distribution of farms in linear element density classes on regions

Ponds are also significantly related to all farm variables except NAFA, but the significance level is higher for the livelihood components. High densities of point elements are related to Region 3 (mean density 0,12/ha), to small farms (md. 0,14/ha) and hobby farms (md. 0,09/ha). Off-farm class A has highest density (md. 0,08).

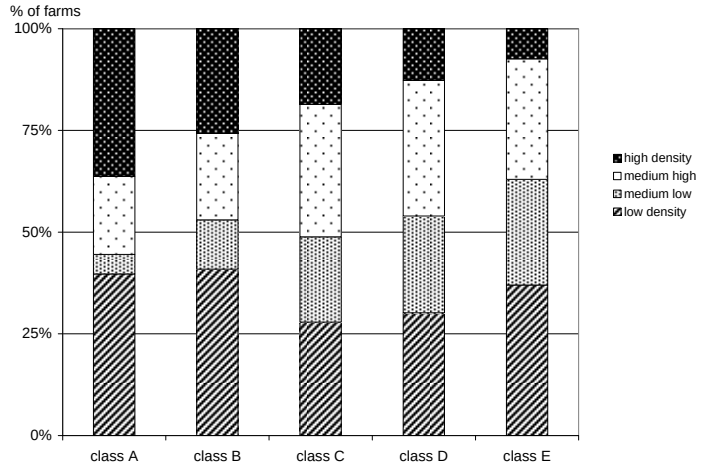

Figure 2. Farms in pond density classes distributed on off-farm income classes (see Table 2 in text)

Woodlots are only significantly related to farm size, farmer type and farm type, but not to region, off-farm and NAFA. High densities are related to small farms (md. 306m^2/ha), hobby farmers (md. 264 m^2/ha) and the farm type small farms (312 m^2/ha).

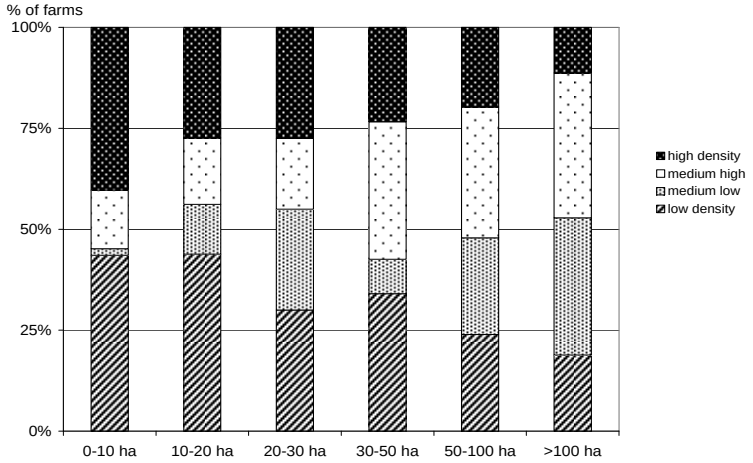

Figure 3. Farms in woodlot density classes distributed on farm sizes

When classifying farms according to their density of each type of landscape elements in high (Class 3 and 4) and low (Class 1 and 2) density, farms belonging to the high density group for all three element types constitute 14% of the sample (48 farms). Among these farms with both a high density and a high diversity in landscape elements, there was a higher frequency than expected of small farms and farms located in Region 3 or in Region 4. Additionally hobby farmers, households where both farmer and spouse derived a major part of their income from outside the farm, and households with no non-farm activities characterised the sample. This points to the group of hobby farms as the ones with highest densities of all elements. However, small farms (0-10 ha) only contain 5% of the total biotope area, and thus do not contribute much to the total area of landscape elements.

On the 346 farms permanent grassland amounted for 16% of the total utilized area. 220 of the farms (64%) have permanent grassland, with a mean proportion of the utilized farm area of 15% on farms, which have permanent grassland. The presence of permanent grassland is linked to farm types: dairy farms (80%) more frequently have permanent grassland on the farm, and small and arable farms (56%) less frequently. Among the farms without permanent grassland, hobby farmers are more frequent than expected, whereas full time farmers more frequently than expected have permanent grassland on the farm.

Quality of landscape elements and permanent grassland

Age was used as the main indicator of quality of landscape elements. As seen in Figure 4, the oldest class make up the largest share of the group for all three types of landscape elements. For the linear landscape elements, age distribution is different in the two dominant hedgerow types: in one-row hedgerows the old elements (>30 years old) constitute by far the largest length of hedges (38%), whereas three-row hedgerows established with economic support implemented in the early 1980s are predominantly less than 30 years old. Figure 4 and 5 show the hedgerows distributed in age-classes, and the dominance of older hedgerows is evident. Also for the point landscape elements, the oldest class (which includes all grave mounds) is largest (Figure 4). Recent establishment of ponds contributes with a considerable share (28%), which should be seen in connection with only two ponds having been removed during the last 5 years. For the area landscape elements, the oldest class of elements make up the largest share of the area as well (57%), while recent establishments accounts for 16%. Removal of area elements during the last 5 years has been insignificant.

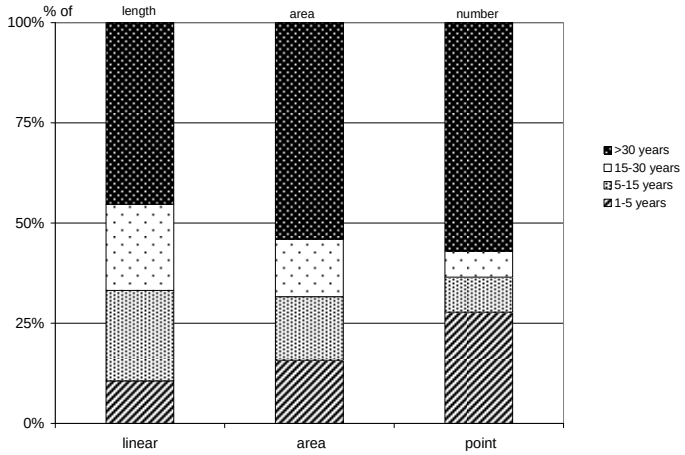

Figure 4. Age distribution of three types of landscape elements

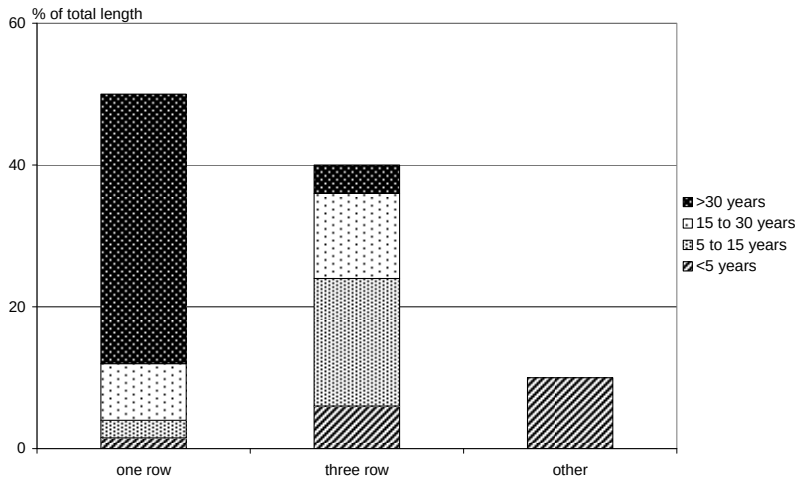

Figure 5. Age distribution of length of two hedgerow types

The age distribution of landscape elements on individual farms show, that 222 farms have old linear landscape elements, 166 farms old ponds and 131 farms old area elements. For all three types, the presence of old elements is predominantly related to farm type, size and farmer type, with dairy farms, full time farmers and larger farm sizes being more frequent than expected. Also landscape type influences the chance of the farm having old landscape elements, with the highest relative frequencies of

farms with old linear elements found in the Region 1 and 5, whereas farms with old point elements are frequent in Region 5 and area elements in Region 2. Other livelihood components do not have any significant influence on the presence of old landscape elements on farms.

Age distribution of permanent grassland on individual farms show, that of the 220 farms with permanent grassland, 103 have permanent grassland older than 40 years on the farm. The distribution of farms classified as "PG High/old", "PG Medium" and "PG Low/young" was influenced by landscape type, with Region 2, Region 4 and Region 5 exhibiting a larger than expected frequency of farms in class "High/old", whereas farms in Region 1 and Region 3 showed less than expected. The distribution of farms in grassland classes also differed among farm types, with an above frequency of mixed farms in the group "High/old", and with arable farms showing more farms than expected in the class "low/young" (Figure 6). Also, although not significant, farms managed by full time farmers tended to be present with an above average frequency in the class "High/old".

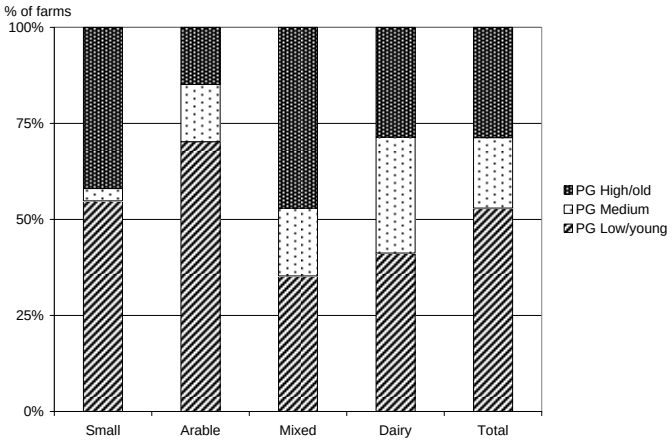

Figure 6. Distribution of farms with varying area and age of permanent grassland on farm types. "PG High/old" are farms with a high area% permanent grassland and a high % old, N=64. "PG Medium" are farms with a medium area permanent grassland and some old, N=39. "PG Low/young" are farms with no old grassland, N=111. Distribution is different among farm types (Chi2=0.0001)

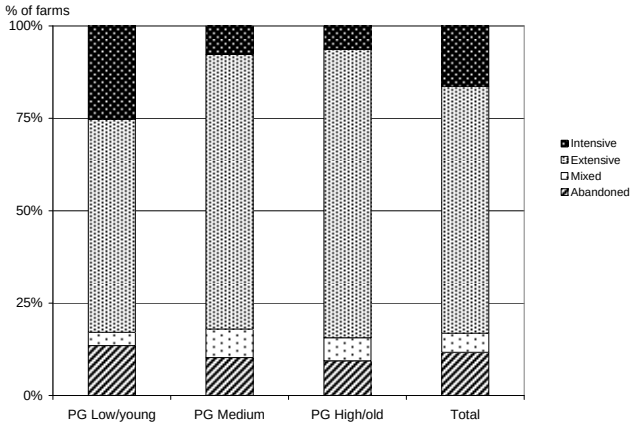

Figure 7. Distribution of predominant grassland management on farm grassland proportion and age. Management differs between classes (Chi2=0.01)(N=214)

Farmer actions: creation and removal of landscape elements and management of grassland

Farmers have planted 9% (64 km) of the existing length of hedgerows within the last 5 years. In the same period only 12 km hedgerow have been removed. 133 (39%) of the farmers have planted or removed hedgerows within the last 5 years. Of these, 97 farmers have only planted hedgerows, 8 have

only removed, and 27 have done both. Both landscape type, farm type and size and farmer characteristics influence the frequency of planting. That more farmers than expected have planted in Region 1, while especially in Region 2 less farmers than average have planted, confirms the general picture in Denmark, where the potential for wind erosion on the sandy soils have lead to more frequent hedgerow planting. Large farms of >100 ha dominate among farmers planting hedgerows, while farms where both farmer and spouse work fulltime outside the farm and those who consider themselves hobby farmers are less frequent. Dairy farms and mixed farms have a higher planting frequency than small and arable farms.

61 (18%) of the farmers have established new ponds within the last 5 years. Although the same variables are important, the farmers who are active in this field are not the same as the ones planting hedgerows. Region 2 and Region 3 show above average frequency of farms with new ponds, with small and mixed farms as well as part time farmers dominating. Also farms without other activities on the farm occur more frequent than average. In general the differences are not as large as for the linear elements.
Establishment of new area elements have occurred on 61 farms with other farm(er) characteristics than for linear elements and ponds. Farmers in Region 2 and Region 5 plant area elements more frequently than expected. Also, farm households with off-farm work have a considerably higher frequency of planting area elements than the others. Additionally, as for planting of linear elements, farmers with on-farm activities of no or little importance were represented above average.

More than two thirds of the farms with permanent grassland manage all their permanent grassland on the farm in the same way. Classifying the farms after their predominant management of permanent grassland as extensive, intensive, abandonment or mixed management (e.g. some fields intensive, other extensive) show, that almost all farms in class “PG High/old” manage their permanent grassland extensively, whereas most farms with any grassland being intensively managed are farms in the class “PG Low/young” and thus have no old grassland (Figure 7). This positive link between age and management may be due to several factors, including low productivity, other production constraints on individual grasslands or to protection measures.

Discussion

We set out to explore the diversity of nature management on organic farms and to examine whether including components of livelihood strategies of the farm household could supplement other farm characteristics in our understanding of this variation. This paper present the first results from the interview analysis of approximately 10% of organic farms in Denmark. Since farm diversity is perceived as being a characteristic of organic farms, and since organic farming has been identified as a diversification strategy, we have been interested in how diversification of farm resources would impact the way nature elements are managed on the farm. Non-agricultural activities on the farm as well as off-farm activities are included in the analysis together with other factors which potentially influence the density of landscape elements, such as landscape context (soils, terrain, cultural factors, etc), farm type and size of farm. The present paper includes analyses of simple relationships, but the strong linkages between relevant farm variables ask for multivariate analysis, which will be done at a later stage.

During the analysis it has become evident that nature elements to some degree have to be analysed as separate entities, i.e. there is no relationship between the share of permanent grassland on the farms and the density of landscape elements. From this descriptive analysis it is not possible to present in-depth explanations of relationships found, however, it indicates that the elements are related to their function on the farm. Permanent grassland is closer linked to the production than the landscape elements and thus

to the farm type, but also hedgerows show some inclination to production parameters like farm type and size of farm.

The age of landscape elements in combination with the limited removal indicate an increased interest in the nature content on the farm, and many farmers are active nature managers in creating new landscape elements. Hedgerow planting takes place with an above average frequency in the heathland, whereas ponds and woodlots tend to be established in the river valley regions and on the young moraine. The inclination to plant hedgerows on the sandy soils in Jutland is related to the need for windbreaks as a protection against wind erosion, which have formerly been a major plague in this area. Large planting schemes took place in the first half of the 20th century to contradict the sand drift, but during the 1960s planting almost stopped and major removals of hedges took place on Zealand in order to rationalise farm management. Planting subsidies however changed the situation in the beginning of the 1980s, as evident in the figure of the age of 3-row hedges above.

The analysis of landscape element densities shows that small and hobby farms contain a relatively higher density of nature areas than larger farms of other types, while it does not show anything about the contribution to the total nature content in the farmland. But it indicates that farmers' nature management vary considerably, and the low overall densities of landscape elements indicate that there is still a need to promote the establishment of landscape elements among groups of farmers.

Old nature elements constitute a surprisingly large part of the total, both for the landscape elements and for the permanent grassland. They do not only present historic evidence of former farm lay-out, but indicates present time activity of non-removal. As a matter of fact the removal of landscape elements is not very significant. There is a considerable potential nature value related to the old landscape elements, and since the old landscape elements are especially related to larger farms and to full time farms, where structural adjustment (e.g. increases in farm and field size) is going on, it seems important to direct attention to their value.

The off-farm income levels show significant contributions to some of the landscape element analyses, i.e. the density of linear and point elements, and the age distributions of landscape elements. No effect of non-agricultural farm activities can be revealed by the present analysis, but we expect that in-depth exploration of types of activities and time spend on the activities may present us with more detailed results. Also the co-variance with other farm(er) variables has to be explored more in detail. As the spouse's participation in the farming activities influence the farmers perception of the farm as a full- or part time farm, it would be interesting to explore the importance of the spouses' involvement or dis-involvement in the farm activities for the nature management. This awaits further analyses.

We have chosen to take our starting point in the population of organic farms. It is our assumption that the large differences shown here among the organic farms and farmers – both in terms of share of farm with nature elements, of the kind of elements present on the farm and in terms of the intensity of management, are not specific for organic farms and farmers but may be similar on farms in general. We aim at exploring the relationships between farm and farmer variables and their attitudes to nature management further, which may enable us to establish groups of farms with a common profile that could be target groups for certain nature management initiatives.

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