

Changes in diversity within Danish agriculture

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Three types of diversity in Danish agriculture are briefly outlined: the oldest one exploiting a variety of natural resources, followed by a type which was characteristic by having a complex land-use pattern of cultivated fields. During the period 1950-80, the diversity was clearly diminishing and a third type under development with barley as dominating crop and livestock concentrated on few holdings, mainly in the western part of the country.

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Over time, the diversity in Danish agriculture has been of three types:

1) The oldest one was characterized by a variety of environmental resources exploited by each farm. Up to 1800, Danish farmers utilized a wide range of landscape elements, from fields and meadows to heaths and commons as well as bogs and forests, but only a few crops were grown in the fields.

2) The next type comprises a variety of cultivated plants which the farmers select and grow in a crop rotation, which gives a complex land-use pattern of the arable land.

3) Since the 1950's, when mechanization and specialization resulted in a clearly diminishing diversity in agriculture, a third type has gradually become the most dominating one.

A contributing factor to the changes outlined above, is that during the last two hundred years Danish agriculture has experienced three major reforms which altered both the pattern of land-use and the system of farming. The first reform was introduced in the period 1790-1830 in connection with the Enclosure; the second one took place from 1880 to 1900 when the production was shifted from vegetable to animal produce, and finally the years 1950-80, a period of mechanization and specialization of farming. Along with these operational changes, the diversity shifted from type 1 and 2 to type 3.

BEFORE 1800

In the 18th century Danish peasants lived by and large on subsistence farming. Cereals were grown – rye for bread, barley and oats for porridge – but very little for forage. The livestock were mainly fed on the grass and weeds of the many communal areas such as meadows, commons, heathland, and bogs as well as woodland and scrub, where the cattle grazed and pigs were fed on mast. Each farm unit operated within a very fixed system and cultivated 30-50 single strips situated far from each other, and, in addition, each farmer had his share of the above-mentioned village areas. Thus each farm was utilizing different landscape types and adapted its production to meet the various daily requirements such as food, clothes, building material and fuel. Also the nutrition ion budget for the arable land was in balance through a transfer of ions within the frame of each farm unit. As a consequence, the system evolved a high degree of diversity in exploiting niches, but was tradition-bound and not open to innovations.

THE PERIOD 1800-1880

The Enclosure movement c. 1800 meant an individualization of farming. With the redistribution of the many strips, each farmer now had his fields assembled with the result that increasingly more of the different types of landscape were reclaimed. This was especially due for the eastern part of Denmark – The Islands and eastern Jutland –, whereas, in general, farmers in western Jutland did as they had done for centuries; well into the 19th century they

	1950	1955	1960	1965	1970	1976	1982
Tractors	178	604	1113	1627	1709	1826	1831
Combine harvesters	4	22	89	306	410	423	375
Forage harvesters			(100)	386	528	540	474

Table 1. Number of machines (in hundreds).
Tabel 1. Antal maskiner (i hundrede).

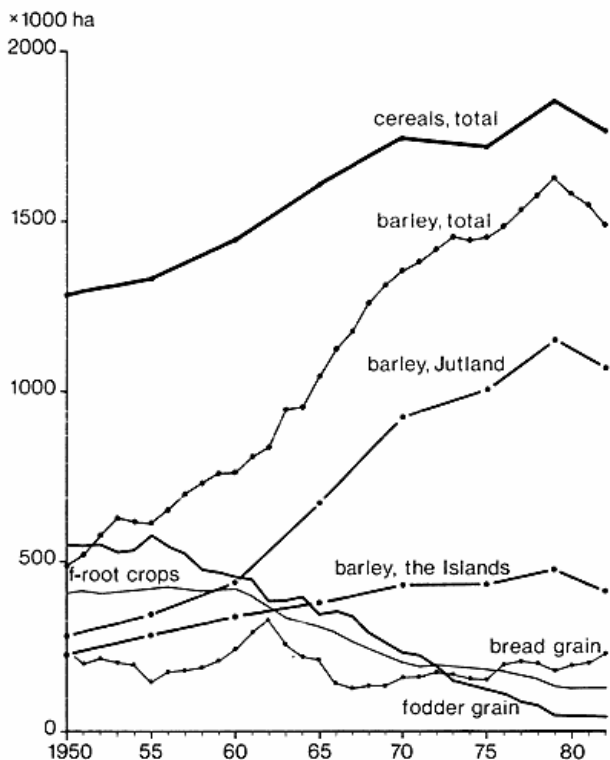


Fig. 1. The development of areas with cereals and fodder crops, 1950-82.

Fig. 1. Udviklingen i arealerne med korn og foderroer 1950-82.

cultivated only a minor part of their land and still utilized larger natural areas for other purposes. With the individualization of agriculture new crops were introduced such as clover and other leguminous plants, and improvement of the soil was initiated by drainage measures and marling. With the Enclosure many former communal areas were reclaimed, and the improvement of the soil led to a more homogeneous farmland used for grain production. In the eastern part of Denmark this development was completed in the mid-19th century, whereas western Jutland did not start until the last decades of the century.

THE PERIOD 1880-1950

Throughout the 19th century the diversity in agriculture of type 1 with the many niches was gradually left and, in the main, each farm unit had its arable land concentrated on the surrounding fields which were, on the other hand, cultivated with more diversified crops than earlier. The development of type 2 was not completed, however, until 1870-1910, influenced not only by overseas import of grains and by favourable sales of animal produce, e.g. butter and bacon, to our industrialized neighbour countries, but also by the rapidly developing cooperative movement.

The expansion of animal husbandry implied cultivation of feed crops. The production of grain was inten-

sified, and large areas were taken in for root crops. The grass fodder was augmented by improved seed and use of fertilizers. From the beginning of this century, mixed farming dominated; each farm unit cultivated various types of fodder to feed the livestock of dairy cattle, pigs, horses, and hens. The common rotation of 6 to 7 crops was in contrast to the farmland of former times which had only a couple of grain specimens. A consequence was, however, that the agricultural landscape gradually was deprived of its natural elements, especially of wetlands.

By and large, this general land-use pattern of type 2 remained unchanged until after World War II. The production rose heavily, however, and the yields doubled from 1920 to 1950.

THE PERIOD 1950-1980

Specialization and decreasing diversity - type 3

When the most serious economic difficulties after World War II had been overcome in the mid-fifties, the farmers began to reorganize and adapt themselves to modern agriculture with its mechanization and consequent higher output per man-day. As shown in Table 1, mechanization of the field work was carried out in the 50's and 60's with the result that the number of both family- and hired work-

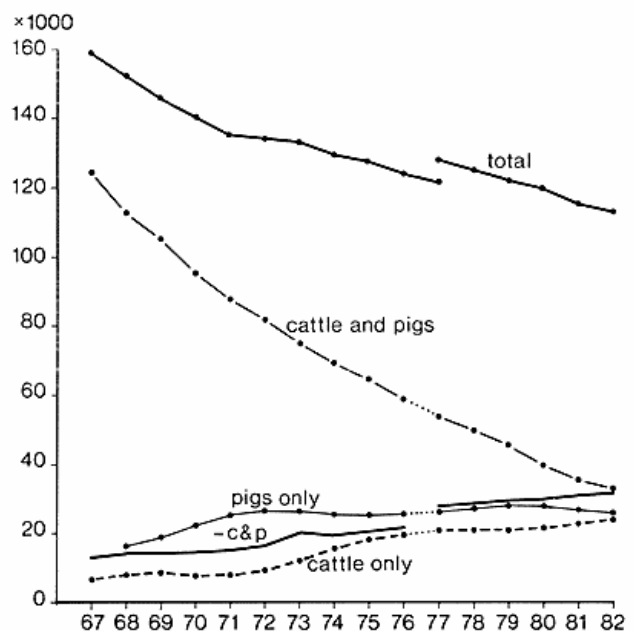


Fig. 2. Number of farms with different combinations of livestock. In 1977 the statistics were changed so that about 5,000 market gardens were included in the agricultural census; as seen on the figure, this influenced virtually only the counts of »holdings without cattle and pigs« - (-c & p).

Fig. 2. Antal landbrug med forskellige besætningskombinationer. I 1977 ændrede man statistikken, så ca. 5.000 gartneribrug også kom med i landbrugstallingerne. Som det ses af figuren, influerede det næsten kun på tallene for »brug uden husdyr«.

	Area of agricultural land	Cereals and pulses (barley)	Root crops	Seeds	Grass and green fodder in rotation	Permanent grassland
1950	3146	1289 (494)	584	95	708	456
1960	3094	1452 (765)	567	77	636	343
1970	2941	1762 (1351)	289	73	500	300
1979	2920	1854 (1621)	247	113	416	263
1982	2887	1777 (1485)	244	197	397	243

Table 2. Land use in Denmark 1950-82 (figures in 1000 ha).

Tabel 2. Arealanvendelse i Danmark 1950-82 (tal i 1000 ha).

The total area of Denmark: 4.308.000 ha.

Danmarks areal: 4.308.000 ha.

ers dropped by roughly 50%. Horses as draught animals virtually disappeared in this period which influenced the cultivation of forage; thus especially oat crops were reduced. Simultaneously, pig breeding based on domestic production of barley expanded vigorously. During the 1950's and 60's, the number of pigs quadrupled, and as barley was considered the best feed for pigs, great endeavours were taken to improve the seed quality so barley could be cultivated anywhere in the country.

In Fig. 1 it is demonstrated how barley ousted the other feed-grains (mixed grains and oats) up to 1980 and, at the same time, absorbed the last 35 years' expansion of areas for cultivation of grain crops. The expansion of barley areas was by far the greatest in Jutland, where it was formerly less grown, but also on the Islands the area was doubled after 1950. Barley is the only Danish grain specimen which can stand monoculture year after year, a property which has made it well suited for mechanized field work.

The development in crop composition shown in Fig. 1 also indicates a heavy decrease in fodder beet areas throughout the 1960's, the reason being that cultivation of beets was very labour-demanding and difficult to mechanize. Mechanization was actually carried out in the course of the 1970's, however, to such an extent that the areas with fodder beets apparently have stabilized at roughly 130,000 hectares. The share of bread grains has not changed significantly, except for a brief increase in area about 1960 due to favourable prices; gradually wheat – mainly grown in the eastern part of the country – has become more important than rye.

With barley on approximately 85% of the grain fields, or well 50% of the total agricultural land, the crop pattern has changed drastically throughout the last 25 years, and the diversity in agriculture has thus diminished to a very great extent. This development in land use runs parallel to the concentration of the animal husbandry from the mid-sixties. After the mechanization of the field-work, about 1970, the investments in agriculture went mainly to cow-houses, milking machines, dung channel cleaners and the like in order to intensify the production of livestock. This trend even increased after 1972 when Denmark joined the EEC. As shown in Fig. 2 the number of holdings with mixed farming with both cattle and pigs decreased drastically from 125,000 to 30,000 in 15 years. About 48,000 of these reorganized holdings have now either cattle or pigs,

and of the remaining 44,000 some have dropped farming completely and others have plant production only. This concentration of animal husbandry on fewer units (Fig. 3) combined with the increasing specialization contribute to diminish the diversity of the Danish landscape.

It was on the Islands specialization was introduced first and on the largest scale, as is demonstrated in Fig. 4. Almost half of all these holdings have exclusively plant production and, of livestock, pigs are leading; in western Jutland two thirds of the holdings have still cattle and many of them mixed farming, but also here specialization becomes of increasing importance.

These trends of decreasing diversity have their drawbacks indeed, in hampering a rational application of labour and causing strain on the environment. Thus Fig. 1 indicates that the spring barley had its peak in 1979, when it covered 55% of the total agricultural area; as for all monocultures, this implies a risk of diseases and pests and, in addition, the already busy months April and August are for barley the most labour-demanding periods.

Spring barley's short growth period moreover leaves the soil uncovered and unutilized for a great part of the year, which might be a risk for sandy soils exposed to wind erosion and leaching of nutrient ions. In addition the increasing concentration of livestock on fewer farm units might make it difficult to utilize the manure in a rational way, when in these years farming is accused of exaggerating the supplies of nitrogen to the fields.

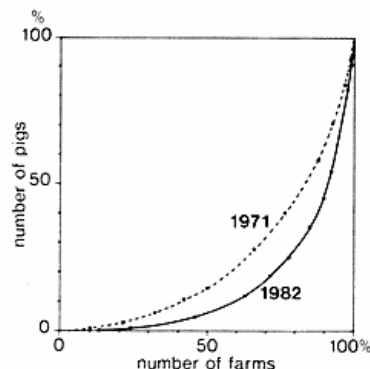


Fig. 3. The concentration of pigs in relation to number of farms with pigs 1971 and 1982.

Fig. 3. Koncentrationen af svin i forhold til antal brugsenheder med svin i årene 1971 og 1982.

In recent years Danish farmers have tried to meet some of the problems outlined here by extending their areas with seed for industrial use – especially rape – and by cultivating more winter crops; thus winter barley, which has been forbidden for 15 years on account of diseases, is now grown again. So far, these measures have only been of trifling influence on the land use pattern, and an adaptation of the livestock/farmland ratio has not yet been performed.

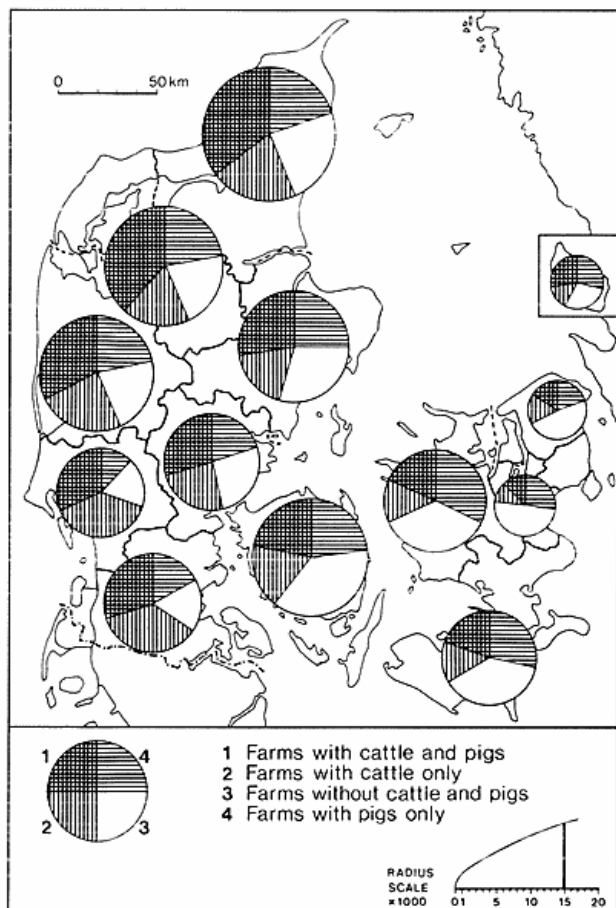


Fig. 4. Distribution of different livestock combinations on Danish counties 1982.

Fig. 4. Fordeling af de forskellige besætningskombinationer på danske amter 1982. 1. Brug med kvæg og svin. 2. Brug, der kun har kvæg. 3. Brug uden kvæg og svin. 4. Brug, der kun har svin.

Resumé

Gennem de sidste århundreder har diversiteten i dansk landbrug været af 3 forskellige typer. Indtil udskiftningen og fortsat ind i 1800-tallet udnyttede det enkelte brug et meget bredt spektrum af ressourcer i landskabet, medens det dyrkede areal var lille og kun med et par kornafgrøder.

Gennem det 19. årh. og især i tiden efter 1880 koncentreredes indsatsen i landbruget derimod på agerlandet med dyrkning af foderplanter i rotation. Medens arealanvendelsen tidligere var præget af de få dyrkede felter og i øvrigt af vild vegetation, blev mønstret nu bestemt af landmandens afgrødevalg, og mosaikken af mange små marker skabte et helt nyt landskabsbillede. Denne udnyttelse af jorden harmonerede med det alsidige husdyrhold, der var almindelig driftsform i dansk landbrug helt frem til 1950'erne.

I de sidste 25 år har en mekanisering og specialisering – først inden for planteavl og dernæst i husdyrholdet – medført en forenkling af arealanvendelsen med vårbyg på gennemsnitlig 55% af landbrugsarealet og i visse egne af Østjylland 65-70%. Husdyrene er samtidig koncentreret på få besætninger, som det ses af Fig. 3 og 4, og kvæget er især at finde i landets vestlige egne.

Denne udvikling har ført frem til en tredje type med nedsat diversitet i landbrugslandskabet og samtidig skabt problemer med hensyn til en jævn anvendelse af arbejdskraft, en ensidig udnyttelse af jorden i en kort vækstperiode og en belastning af visse egne med store staldgødningsmængder.

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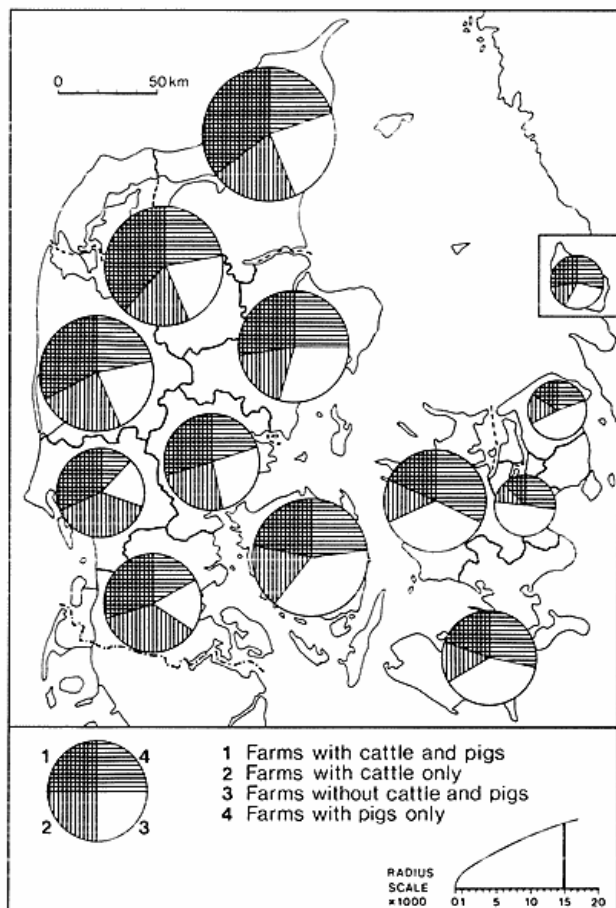


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