The Agro-geographical Division of Denmark and the Time Factor

By Aa. H. Kampp

Abstract

Denmark has been divided into agricultural regions based on the soil capability as measured by the crops and expressed through isodone and isodense maps from 1837–1946.

Owing to the enormous increase in barley areas in Denmark since then, it has been necessary to examine the effectivity of the dynamics in the pattern of the geographical distribution of barley in 1962. The new isodense map shows a close similarity to all older (isodone- and) isodense maps and so confirms together with a land valuation village map for 1688 the temporal stability of the division. The main trends of a long-term development are illustrated by statistics and by maps.

Up to the present a comparison between agro-geographical researches from different countries has been very difficult, each writer using his own methods, measures, indices etc. Now agricultural geography however is moving towards the use of precise and measurable criteria. Like the Latin taxonomy of biology, an English terminology and taxonomy for the agricultural landscape is to be worked out (IGU Commission for Agricultural Typology).

This research into agricultural regionalization is at the same time a topical study in a method and technique of measuring agricultural intensity and a method of integrating agricultural statistics. It deals more with the effects of human activities as visible in the landscape than with economy. To some extent new methods have been elaborated for the delimitation of regions and for the regional concentration of branches.

In an earlier work (*Kampp* 1959) Denmark has been divided into 7 agro-geographical regions (fig. 1), principally on the basis of parish statistics of the total yield per hectare of a series of crops (expressed

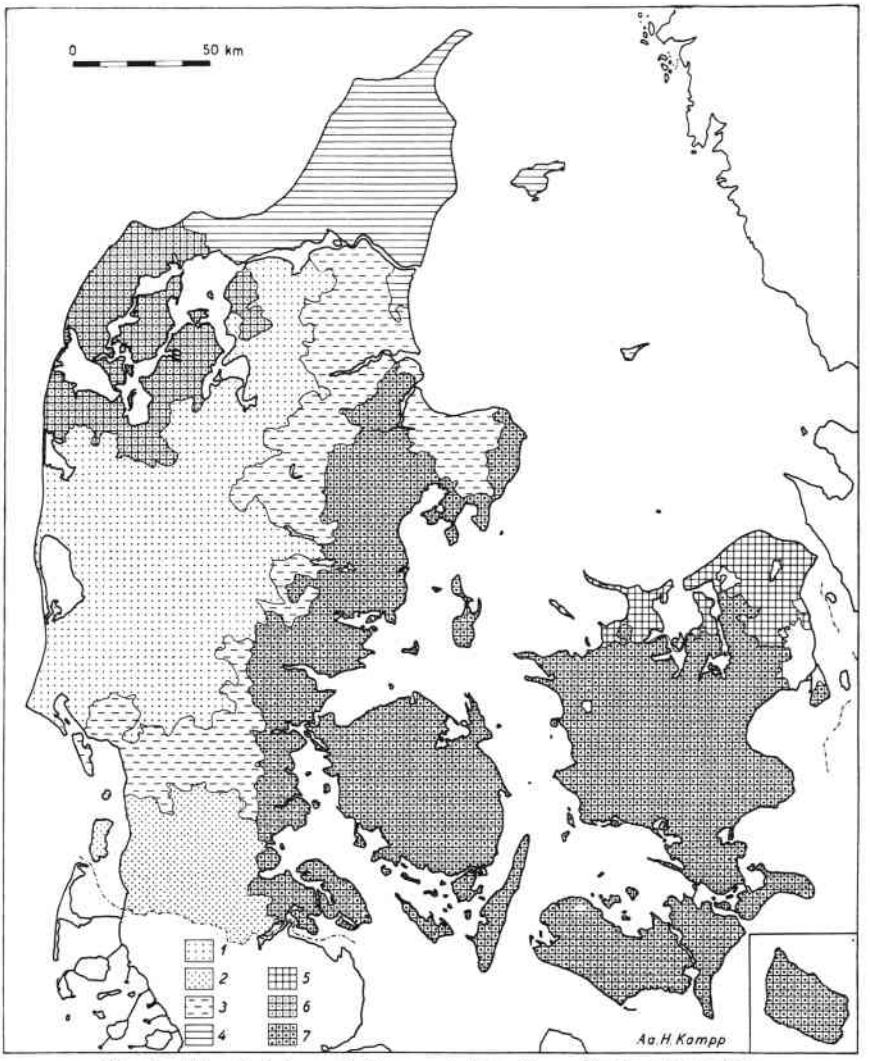

Fig. 1. The division of Denmark into 7 agricultural regions.
Fig. 1. De 7 landbrugsregioner (på grundlag af kort fra 1907, 1937-39 og 1946). 1. Region 1, det landbrugsgeografiske Vestjylland *(West Jutland)*. 2. Region 2, det landbrugsgeografiske Sønderjylland *(South Jutland)*. 3. Region 3, overgangsområderne *(the transitional zones)*. 4. Region 4, det landbrugsgeografiske Vendsyssel *(Vendsyssel)*. 5. Region 5, det landbrugsgeografiske Nordsjælland *(Northern Zealand)*. 6. Region 6, det vestlige Limfjordsområde *(North-West Jutland)*. 7. Region 7, det landbrugsgeografiske Østdanmark *(Eastern Denmark)*.

in isodones) for 1937–39, together with statistics of wheat-barley areas as a percentage of the rotation area (isodense) for 1939. The result was subsequently subjected to a critical revision based on corresponding material from 1837, 1907 and 1946.

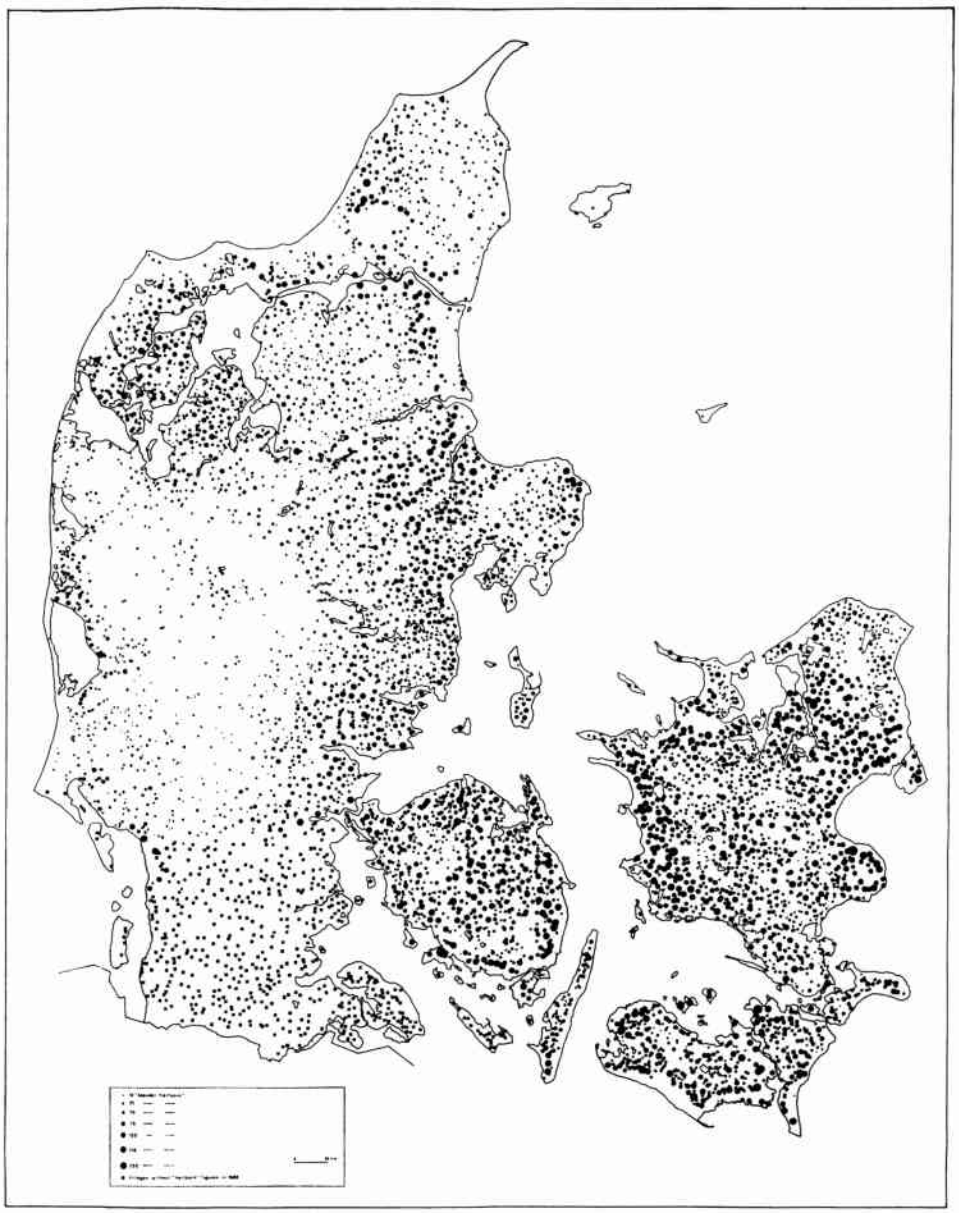

Fig. 2. Map showing the "hartkorn" figures at the time of the great land register.

Fig. 2. Hartkornskort for 1688. Udarbejdet på grundlag af kortbilag: „10 kortblade i farver over udbredelsen af danske landsbytyper" (*Hastrup* 1964). Cirkelarealerne er proportionale med hartkornstallene på den store matrikels tid for landsbyer og enkeltgårde, som i 1688 havde et hartkorn på 15 tdr. og derover. Kvadraterne viser landsbyer, hvis hartkornstal ikke kendes.

In a smaller article (*Kampp* 1964), attention has been drawn to the regional map's similarity to "Kaart over Hartkornets Fordeling i Kongeriget Danmark i Aaret 1873" (Map of distribution of "Hartkorn" in the Kingdom of Denmark in the year 1873, "Hartkorn" being a Danish unit of land valuation based on estimated productivity), a supplement to Statistical Tables 3,32 (*Meldahl* 1877).

It has now become possible to elucidate the stability of the basis for classification over an even greater span of years with the help of a map, which has been prepared on the basis of "10 map sheets in colour of the distribution of Danish village types; scale 1:300 000", map-appendages to a dissertation (*Hastrup* 1964) (fig. 2), in which the circle areas are proportional to the "hartkorn" figures at the time of the great land register. All villages and single farms, which in 1688 had a "hartkorn" of 15 tdr. or over, are included on the map. The squares indicate villages whose "hartkorn" figures are missing from the statistical table (*Pedersen* 1928); they therefore merely indicate the density of the villages, and it can be taken that they are too large to the west and too small to he east in relation to the circles on the map, which are variable in proportion to the areas. As so often is the case on maps of this type, the density appears less than it ought to be in the darkest areas, because some of the circles either partially or completely overlap each other.

Attempts have been made to trace the geographical differences in soil quality even further back in time with the aid of agricultural population density, which needless to say allows of no direct proof; but if one assumes that in earlier times it was directly proportional to the soil quality, and thus probably inversely proportional to the size of the parish, then one can obtain an approximate measure for the agricultural population density, and thus presumably also for the soil quality by simply placing a dot of uniform size in every single parish. This has been done on a parish map for 1925, since the minute changes in parish boundaries which had taken place by that time can scarcely have changed the total picture to any great extent from that unknown point far back in time, when the parish boundaries were drawn up, in such a way that fig. 3 must, *to some degree,* reflect the geographical distribution of soil quality in the unknown days of long ago when the division into parishes was undertaken (cf. "Bebyggelseskort for 13. århundrede", fig. 4, *Christensen* 1938).

I should like to thank *Statens almindelige Videnskabsfond,* which has made possible a further continuation of research by financing

assistance in the processing of figures, and *Danmarks Statistiks Landbrugsafdeling*, which has placed the basic material for 1962 at disposal. It has unfortunately not been possible to obtain figures enabling the preparation of isodone maps for 1962, but as the first-mentioned publication appears to indicate, an isodense map alone must be presumed to be of greater interest for an estimation of the possibilities of shifts in the regions.

The wheat-barley areas have, as has also been underlined from Swedish quarters (*Nordborg* 1959), made greater advances in recent years in Jutland than on the Islands. On the one hand, however, Jutland is, as is well-known, divided into the agricultural regions 1, 2, 3, 4, 6 and 7 and the Islands into 5 and 7, and furthermore the shifts in the wheat-barley areas in favour of the low regional numbers are at any rate partly a logical consequence of the decline in agricultural areas to the east and the progress to the west (table 3).

Although there has been a considerable dynamism in the form of progress in wheat-barley areas to the west, figs. 4-7 would appear to indicate that the distribution pattern of these crops as an agro-geographical division need not alter the earlier established regions, and the isodense map fig. 11 justifies a continued maintenance of the division from 1959.

In correspondence to the strong progress of the wheat-barley areas as a percentage of the total rotation area, the isodense signature column, which is determined by the distribution curve, covers far larger figures than previous years:

Table 1.

Isodense-signature-no.	1	2	3	4	5
1907	≦ 1,4 %	1,5–5,9	6,0–11,9	12,0–16,4	≧ 16,5 %
1939	≦ 9 %	10–19 %	20–27 %	28–33 %	≧ 34 %
1962	≦ 24 %	25–35 %	36–42 %	43–49 %	≧ 50 %

The regions themselves appear to be still unchanged, but their content varies, owing partly to the altered distribution of crops and livestock, yield per hectare, milk yield per cow, the quality of cultivated plants, fruit growing etc.

The process of industrialization within agriculture after the end of the Second World War occupies a prominent place in the series of agrarian revolutions. It has resulted in a radical change in structure and drastic changes in the cultural landscape: through adaptation of the fields to the use of machines, changes in the use of fields and the tendency towards specialization.

Fig. 3. "One dot for one parish" reflecting to some degree the distribution of primeval soil quality.

Fig. 3. På dette kort er anbragt en prik i midten af hvert sogn; prikkernes fordeling kan således antages at repræsentere boniteten langt tilbage i tiden. Dette synspunkt støttes af, at kirketienden synes at have været omtrent lige stor i de enkelte sogne uafhængigt af arealet.

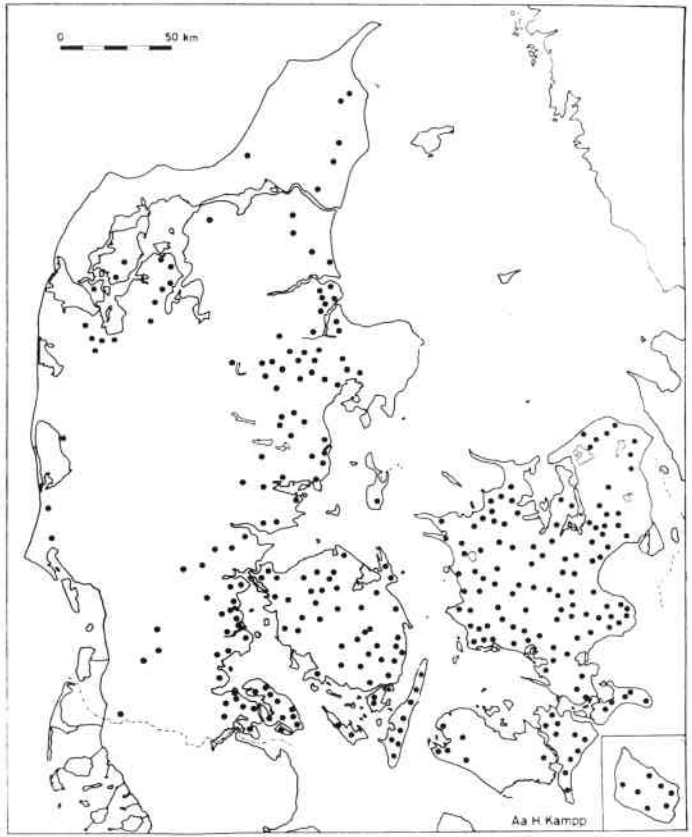

Fig. 4. Wheat area 1951. Each dot = 275 ha.

Fig. 4. Hvedearealerne i Danmark 1951, Prik = 275 ha. Der er nogen tilbagegang siden 1939, men den geografiske udbredelse er uændret.

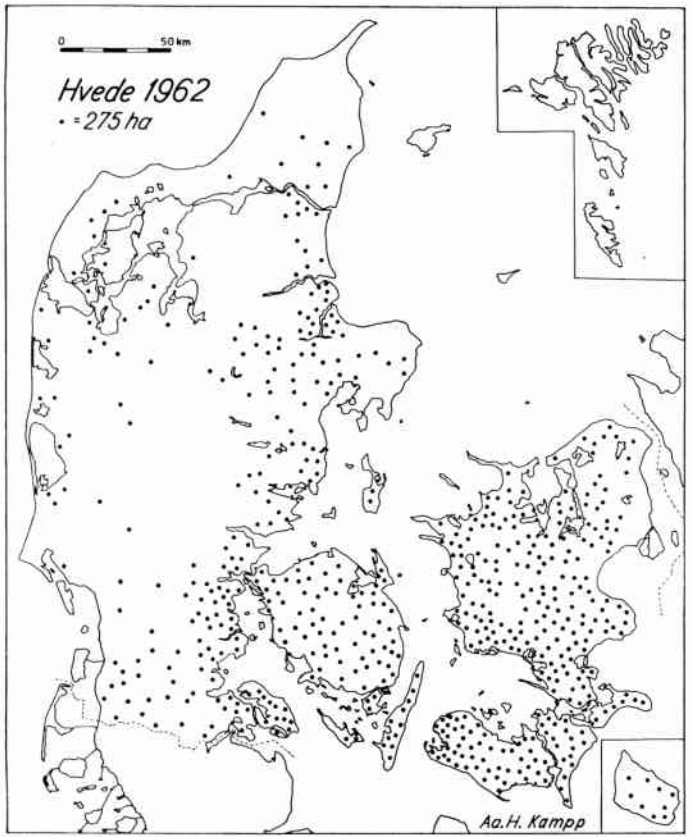

Fig. 5. Wheat area 1962. Dot = 275 ha.
Fig. 5. Hvedearealerne 1962. Der er stadig ingen væsentlige ændringer i udbredelsesmønsteret.

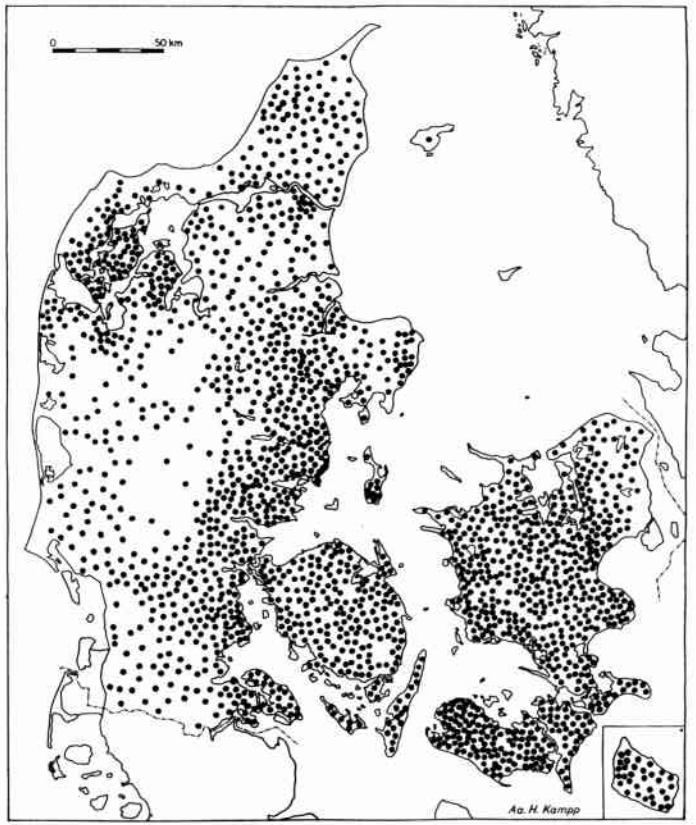

Fig. 6. Barley area 1951. Dot = 275 ha.
Fig. 6. Bygarealerne 1951. Der er kun ringe forskel mellem dette kort og kortet over 1939.

While more and more farmers, at any rate in East Denmark, are moving away from a marked livestock production to a more plant-breeding production, interest in finding new crops is growing. Up to the present, this interest has shown itself in increased production of grain, seed and other commercial crops, especially rape and mustard. The decline of oat is connected partly with "horse reduction".

The reduction in areas with root crops is undoubtedly connected with the simultaneous decline in the number of dairy cows. In regions 5 and 7 the number of dairy cows has been reduced from the mid-1930's (but at the same time with an increase in the milk-yield per cow); in regions 1 and 2, on the other hand, the number of dairy cows has increased, and although the number of dairy cows for the whole country in 1964 was only 86 % of the number in 1938, there has been no change in the total milk production. The reduction in areas with root crops and the number of dairy cows has been greatest in those parts of the country that were most affected by the drain of labour from agriculture to the towns. This reduction may in the long run have unfortunate consequences for the rotation of crops and thereby for the yield.

Contemporaneous with the farmers' increasing opportunities for supplementing their earnings in industry, an extensification is occurring in the use of agricultural areas, thus introducing a new phase in sheep-breeding.

The increase in the number of sheep is distributed fairly evenly over the whole country except in region 2, where the number has been very stable throughout the years, but which is still the part with most sheep per area unit. Many of the hilly fields, which it was quite possible to cultivate with horse-drawn implements, must lie unused today, because it is too dangerous to work on them with modern machines. In many cases it has proved practical to lay out areas with permanent grass for sheep-breeding, and in areas where grass-seed has a place in the rotation of crops, sheep have proved suited for exploiting after-growth and for cleaning off the fields. Sheep-farming makes at the same time small demands on buildings, which moreover are only used for a short time each year, and sheep-farming can be fitted into farming arrangements without any great adaptations and with favourable economic results.

Natural conditions make possible the growing of many cultivated plants; which ones are chosen depend on tradition and economic conditions. A regionally determined pattern of growing results from the fact that farmers in the district concerned make practically

Table 2.

	Cows pr. km² agricultural area	% of rotation area							Number of farms examined
		Grain	Root crops	Wheat + barley	Oat	Mixed grain	Potatoes	Grass	
Grønhøj 1966	41	57	17	31	15.0	10.7	4.6	25.7	62
region 1, 1946	44	44	22	5.4	8.6	21.2	7.9	33	
Frederiks parish 1946 .	36	41	28	0.3	6	25	17	26	
Randerup parish 1966 .	44	68	10	34	24.4	1.3	0.0	37.8	63
region 2, 1946	27	40	20	8.0	14.1	10.2	2.7	39	
Randerup parish 1946 .	33	36	5	8.8	22	2	1	57	
Part of Sejling 1966	75	45	21	28	6.7	8.7	0.0	33.2	15
region 3, 1946	49	48	22	14.1	15.8	12.7	4.8	29	
Sejling parish 1946	77	48	16	16.5	19	8	3	29	
Part of S. Tornby 1966	69	52	22	34	10.4	4.7	1.7	27.3	22
region 4, 1946	53	48	19	8.5	11.2	20.5	4.5	32	
Tornby parish 1946	65	44	18	8.3	9	21	3	34	
Kregme 1966	32	60	10	46	7.9	0.0	3.2	18.5	14
region 5, 1946	54	54	20	22.1	14.9	9.0	5.2	23	
Kregme parish 1946	53	54	18	18.5	17	6	7	24	
Heldum parish 1966	45	53	12	40	11.4	0.0	0.9	32.4	11
region 6, 1946	52	47	21	18.8	16.6	9.7	3.6	31	
Heldum parish 1946	66	47	17	21.4	17	8	1	30	
S. Vestud 1966	39	76	18	71	2.5	2.0	0.0	17.8	19
region 7, 1946	55	54	20	30.2	14.6	6.0	0.0	21	
Borre parish 1946	56	50	21	34.4	9	6	1	12	

speaking the same decisions in response to fairly uniform conditions over larger areas. Maps of farming will always be mosaics.

The content of the regions is presumably altering more rapidly now than earlier. With the simplifying of administration, partly through an increase in the size of the administrative and thereby the statistical units, which is under way at present, the possibilities for future detailed mapping of the country as a whole deteriorate.

The figures from 1966 in table 2 have been brought about through students' observations in part, and also partly by means of interviews with the owners of the farms; here lie the same sources of error as for the official statistics, which have been produced in a roughly analogous way, and the material is in the former case even more slender than the sampling-material on which the official statistics rest.

The official figures from the parishes in question of 1946, com-

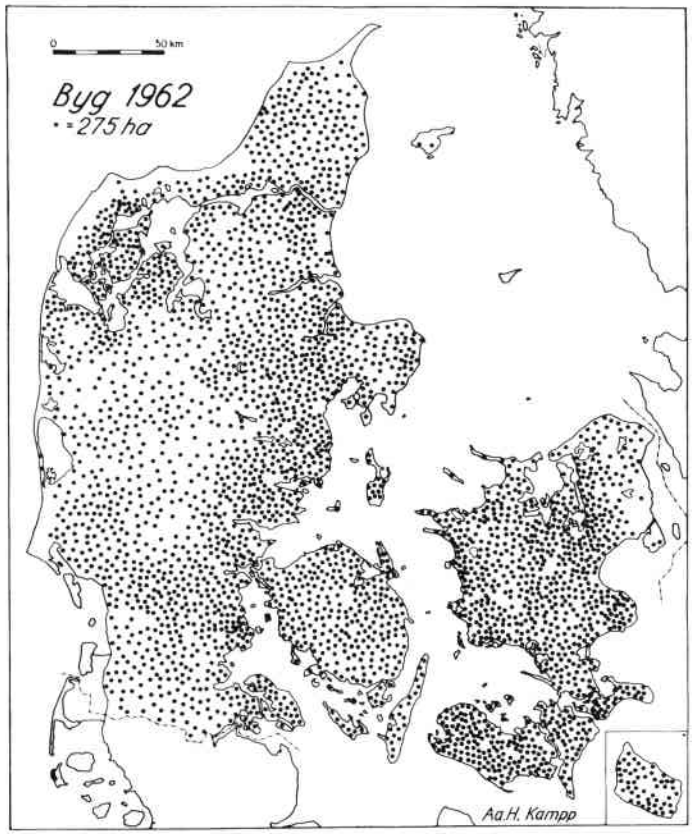

Fig. 7. Barley area 1962. Dot = 275 ha.
Fig. 7. Bygarealer 1962. Arealet er gået stærkt frem siden 1951, ikke mindst i Jylland, der imidlertid er fordelt på landbrugsregionerne 1, 2, 3, 4, 6 og 7; det viser sig da også, at forskydningerne kun ændrer inddelingsgrundlaget minimalt (se fig. 11).

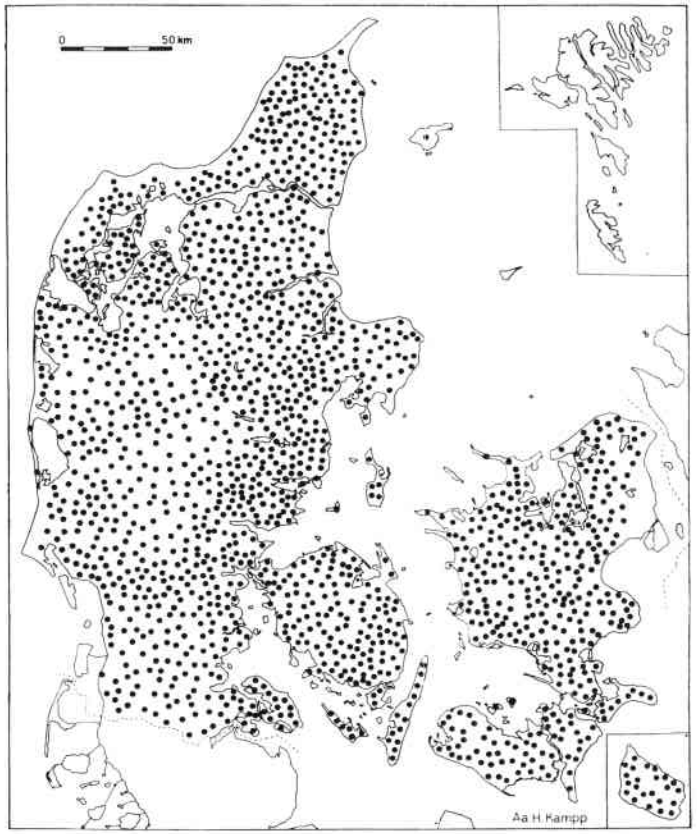

Fig. 8. Dairy cows 1951. Dot = 1000 animals.
Fig. 8. Malkekøer 1951. Hver prik = 1000 køer. En vestgående bevægelse i malkekvægholdet siden 1939 kan spores.

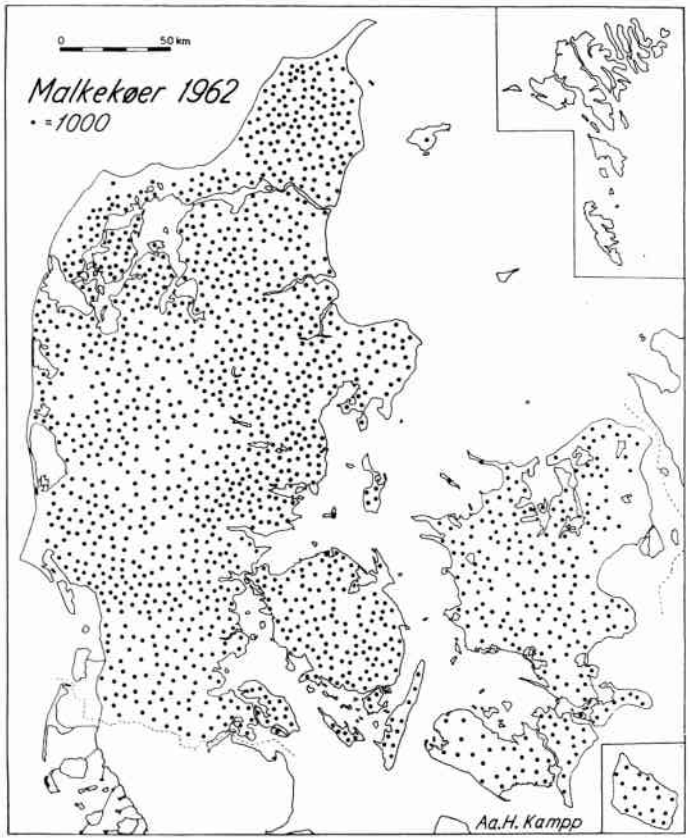

Fig. 9. Dairy cows 1962. Dot = 1000 animals.

Fig. 9. Malkekøer 1962. Den vestgående bevægelse er fortsat, tætheden i Østdanmark er blevet mindre, i Vestdanmark større,

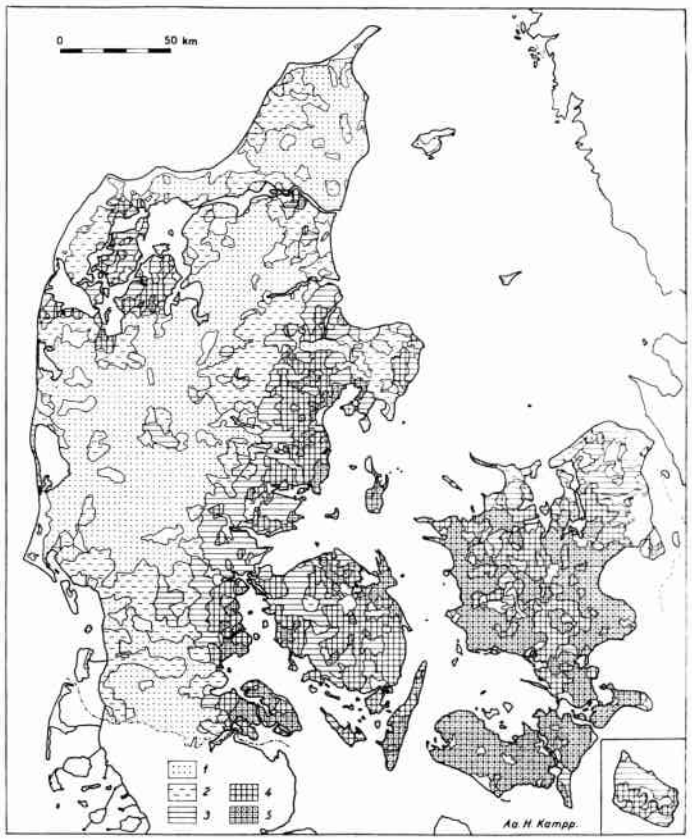

Fig. 10. Isodense map 1946.

Fig. 10. Isodenskort (Kort over hvede- + bygarealer i % af omdriftsarealet) for 1946. Dette kort var med til at danne grund-

pared with the official figures from the whole region, give an *indication* of to what extent the examined areas are representative.

The number of dairy cows per km.² agricultural area would appear to be almost unchanged in region 1, and to have increased greatly in 2 and 3; in the other regions there has been a decline since 1946. The wheat-barley percentage is rising in the following order: 3, 1, 4, 2, 6, 5, 7; the percentage of grain (÷ wheat-barley) is after the falling scale: 2, 1, 4, 3, 5, 6, 7.

Barley is today the most prevalent grain crop in all regions; only in region 2 does oat measure up to barley, in region 1 oat + mixed grain. Mixed grain moreover plays a considerable role in region 3. Rye plays a declining role today with the exception of the example from region 5.

Butter production has increased in all regions, but is still smallest in 1 and 2, greatest in 5, 6, and 7. Cattle breeds have become far more mixed, and Jerseys have become more numerous.

The method of division employed has been devised for Denmark. It was not originally intended to be suitable for use without modifications in other countries, partly because the climates and therefore the cultivated plants are different, and partly because the statistical data are not equally reliable in all countries, and finally because the agricultural techniques are at different stages, or else because agriculture is subject to differing economic systems, and thereby differing social conditions. In undertaking a possible global investigation of soil quality, it may be found fruitful to establish by means of cultivation experiments how many calories can be obtained at a given point in time by the greatest crop yield from soil in an optimal condition of manuring and irrigation in a given locality, and perhaps how large an amount of protein can be produced by the most protein-providing plant per hectare. It will probably become apparent that the climate under such conditions is practically speaking the single determining factor. In Lund, however, this method has been used (*Kristensson* 1963) in the division of Scania, and *K.-E. Frandsen* has employed it in the division of Schleswig-Holstein; but if this method of division is to be used in more distant regions, it will certainly have to be modified at least.

For pedagogic reasons the division has been simplified to 3 regions (*Kampp* 1964 a): "East Danish" and "West Danish" agriculture together with the transitional areas; while such a method naturally facilitates a broad understanding, it provides at the same time fewer possibilities for detailed investigations.

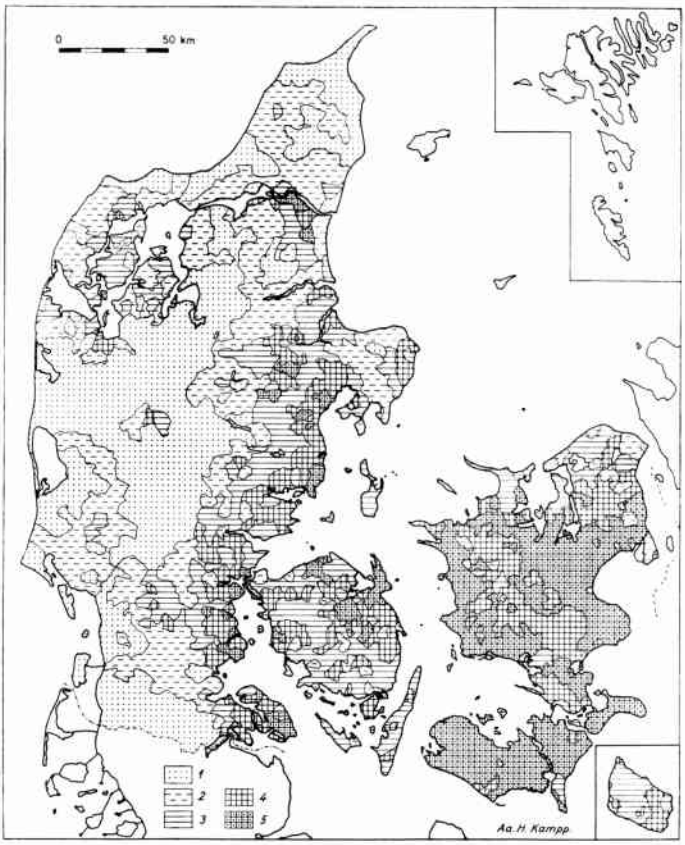

Fig. 11. Isodense map 1962.
Fig. 11. Isodenskort for 1962, som synes at vise, at der stadig ikke er grund til at ændre inddelingen af 1959.

In this division of the country into 7 resp. 3 regions a regionalization has been crystalizing through the centuries; but within this regionalization a more far-reaching specialization is gradually developing.

In accordance with the simplification mentioned, the regions are grouped as follows in the ensuing table:

regions 1 + 2 = W

regions 3 + 4 = M

regions 5 + 6 + 7 = E.

Table 3.

	W	M	E	
Total area in thous. hectares	1 130	920	2 110	
Agric. area 1951, thous. hect.	743	692	1 618	
Agric. area 1962, thous. hect.	788	711	1 610	
Rotation area 1951, thous. hect. ...	646	594	1 432	
Rotation area 1962, thous. hect. ...	683	609	1 457	
Change in wheat-barley area 1951–62, thous. hect.	+ 102	+ 77	+ 214	(of which 187 from region 7 alone)
Change in grass area outside rot. 1951–62, thous. hect.	+ 13	+ 4	– 37	
Change in number of dairy cows, thousands	+ 32	+ 29	– 156	

While the agricultural area has progressed in W, and declined in E, the rotation area has progressed in all three regions, but greatest in W, particularly from a relative viewpoint. Parish statistics for grass *within* rotation are not available for 1962, but county (shire) statistics for the years 1951–62 show particularly progress for Ringkøbing, Ribe and Tønder shires; the total figures for the Islands and the county totals for the purely East Jutland shires show a decline, while the "mixed" counties, e.g. Viborg and Vejle, show as was expected almost a standstill.

Viewed statistically, the number of dairy cows and the grass regions have undergone a decline both outside rotation and as a whole, but the spontaneous dynamism of regionalization has made itself felt amongst other things in the westward-moving geographical shift in the distribution of grass areas and of dairy cows, which is expressed in table 2.

RESUMÉ

Danmarks landbrugsgeografiske inddeling og tidsfaktoren.

I et tidligere arbejde (*Kampp* 1959) inddeltes Danmark i 7 landbrugsgeografiske regioner på basis af sognestatistik over sammenregnede hektarudbytter af en række afgrøder (udtrykt ved isodoner) for 1937–39 samt over hvede-byg-arealerne i procent af omdriftsarealet (isodenser) for 1939. Resultatet blev dernæst underkastet en kritisk revision på grundlag af tilsvarende materiale fra 1837, 1907 og 1946.

Senere (*Kampp* 1964) er påvist overensstemmelse mellem regionskortet og „Kaart over Hartkornets Fordeling i Kongeriget Danmark i Aaret 1873" (*Meldahl* 1877).

I nærværende afhandling er søgt at belyse inddelingsgrundlagets stabilitet endnu længere tilbage i tiden, dels ved hjælp af et Hartkornskort

for 1688 (fig. 2), som er tegnet på grundlag af et arbejde af *Hastrup* (1964), og dels ved hjælp af et kort med en prik i hvert sogn (fig. 3), som kan antages til en vis grad at afspejle jordbonitetens geografiske fordeling på sognedelingens længst forsvundne, ukendte tid.

Dernæst er inddelingsgrundlaget undersøgt for 1962; et isodonkort kan ikke fremskaffes for dette eller senere år, og sandsynligvis er 1962 det sidste år, for hvilket et isodenskort kan fremstilles. Selv om der har været en anselig dynamik i form af fremgang i bygarealerne mod vest (fig. 4), synes isodenskortet fig. 5 at retfærdiggøre en fortsat opretholdelse af inddelingen af 1959.

I overensstemmelse med den stærke fremgang i hvede-byg-arealerne i procent af det samlede omdriftsareal dækker isodenssignaturrækken, der er bestemt ved fordelingskurven, over langt større tal end tidligere år (tabel 1).

Men selv om regionerne således synes uændrede fra arilds tid til i dag, så veksler deres indhold, bl. a. med afgrødearealernes og husdyrenes ændrede udbredelsesforhold, hektarudbytter, mælkeydelse pr. ko, kulturplantearter og -sorter m. m., antagelig i hastigere tempo nu end tidligere.

Med den forenkling af administrationen, bl. a. gennem en forøgelse af størrelsen af de administrative og dermed de statistiske enheder, der for tiden er i gang, vil mulighederne for fremtidig detailkortlægning af landet som helhed stadig forringes. For at vise de sandsynlige ændringer i regionernes indhold har man derfor undersøgt begrænsede, så vidt muligt repræsentative, dele af de enkelte regioner (tabel 2).

Antallet af malkekøer pr. km² landbrugsareal synes næsten uændret i region 1 og gået stærkt frem i 2 og 3; i de øvrige er det gået tilbage siden 1946. Hvede-byg-procenten er stigende i følgende orden: 3, 1, 4, 2, 6, 5, 7; procenten af korn ÷ hvede-byg er efter faldende skala: 2, 1, 4, 3, 5, 6, 7.

Byg er i dag den mest udbredte kornart i samtlige regioner; kun i region 2 kommer havren op på siden af den, i region 1 havre + blandsæd. Blandsæd spiller desuden en betydelig rolle i region 3. Rugen spiller en forsvindende rolle. Smørproduktionen er steget i alle regioner, men er stadig mindst i 1 og 2, størst i 5, 6 og 7. Kvægracerne er blevet langt mere blandede, og Jerseyracen er blevet mere talrig.

Efterhånden som flere og flere landmænd, især i Østdanmark, er gået fra udpræget husdyrproduktion til en mere planteavlspræget produktion, er der sket en øget produktion af korn, frø og andre handelsafgrøder, især raps og sennep. Havrens tilbagegang står bl. a. i forbindelse med „afhestningen". Reduktionen i arealer med rodfrugter hænger sammen med tilbagegangen i antallet af malkekøer; denne udvikling kan i det lange løb få uheldige konsekvenser for sædskiftet og dermed for høstudbyttet.

Det har ikke været hensigten at udarbejde en inddelingsmetode, som kunne anvendes uændret på andre lande. I Lund har man dog (*Kristensson* 1963) anvendt den til inddeling af Skåne, og *K.-E. Frandsen* har anvendt den til inddeling af Schleswig-Holstein; men skal den anvendes på fjernere områder, må den i det mindste modificeres under hensyn til f. eks. kulturplanter, landbrugsteknik, økonomiske systemer, sociale vilkår og statistiske datas pålidelighedsgrad.

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