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A NOTE ON WATER CONTROL IN DENMARK

THE total area of Denmark is 43,043 square kilometres (the Islands comprising 13,410 sq. km. and Jutland 29,633 sq. km.). About 72 per cent. both of the Islands and of Jutland is agricultural land, the total agricultural area being 31,083 sq. km. (9,683 sq. km. in the Islands, of which 8,896 sq. km. is arable and 787 sq. km. permanent pasture; and 21,400 sq. km. in Jutland, of which 18,541 sq. km. is arable and 2,859 sq. km. permanent pasture).

Drainage is the most important form of water control in Denmark, but irrigation and flood control are also used.

Drainage

Burned drain-pipes were introduced in 1848 on an estate near Copenhagen. Danish farmers have since adopted drainage widely. By 1929 about 27 per cent. of all agricultural land had been drained (48 per cent. on the Islands, which have rather heavy soil, and 14 per cent. in Jutland, which has a great deal of light soil). In the last two or three decades much additional land has been drained, but in several instances existing drains have been replaced by systems of greater capacity, and it is not known exactly how much land has never been drained.

Legislation concerning soil improvement was introduced in 1921, but the most important Act in this connexion was passed in 1937 and has been supplemented several times since. The 1937 Act had two purposes: (1) to create employment, and (2) to improve the agricultural land. At present, according to the Act, a farmer may obtain a government grant (tax free) of up to 50 per cent. of the expenditure on wages and pipes if his project is accepted. Furthermore, it is possible to obtain a loan amounting to from 500 to 16,000 kroner (in special cases, 20,000 kroner), at an interest rate of 6 per cent. per annum.¹ No repayment is due during the first two years, but thereafter repayments are made twice a year over a ten-year period. If several farmers are

¹ 20 kr. = 21 shillings = 3 dollars, approximately (1960).

involved in a project, loans up to 70,000 kroner (or even more) are obtainable.

Figures showing the results of the Act are given in Table 1.

It has not been possible to get separate figures for the different kinds of undertaking. It can be seen that the government grants covered 37 per cent. of the total expenditure.

TABLE 1. *Areas improved under the Soil Improvement Act of 26 February 1937 and supplementary Acts (1937-58)*

	Drainage		Irrigation	Diking	Maring, liming, cultivation	Total acreage, ha.	Total expenditure, million kroner	(Of which wages, million kroner)	Government grants, million kroner
	ha.	as percentage of agricultural land in 1958							
The Islands	192,968	19.9	466	396	5,004	198,834	192.0	99.7	70.6
Jutland	258,241	12.0	1,339	1,191	20,767	281,538	268.0	138.8	100.6
Denmark	451,209	14.5	1,805	1,587	25,771	480,372	460.0	238.5	171.2

Source: Publications from the Statistical Department.

Few figures concerning the effect of drainage are available but in Table 2 the results from an experiment carried out by the Danish Health Society are given.

TABLE 2. *Field experiment on the effect of drainage covering one rotation. Yield in quintals*

Year	Rotation	Not drained	Drained	Increase	Increase per cent.
1927	Oats . . .	22.9	26.1	3.2	14
1928	Swedes . . .	537.0	663.0	126.0	23
1929	Barley . . .	16.1	23.5	7.4	46
1930	Wheat . . .	19.5	28.1	8.6	45
1931	Mangolds . . .	277.9	595.3	317.4	114
1932	Oats . . .	22.9	26.1	3.2	14
1933	Hay . . .	95.9	129.2	33.3	35
1934	Hay . . .	98.3	108.3	10.0	10

Source: J. M. Jakobsen, *Vejledning i Dræning*, København, 1946, p. 167.

Irrigation

As mentioned earlier, irrigation has not played so important a role as drainage, but it has been rather common to irrigate meadows near watercourses by damming up water, and this practice is still in use to

some extent. Latterly, irrigation systems (sprinklers, &c.) have been introduced on many farms. In 1957, 1,600 farms (the total number of farms is about 199,000) were recorded as using this kind of irrigation and many more have been added since. It is not known, however, how much land is irrigated. Experiments have been carried out in order to discover the effects of irrigation. Some figures are given in Table 3.

TABLE 3. *Experiments on irrigation, carried out at St. Jynde vad Experimental Station 1950-5. Six years' rotation. Average*

Rotation	Water supply mm.	Yield in crop units* per hectare		
		non-irrigated	irrigated	increase
Oats . . .	62	34.4	46.1	11.7
Rye . . .	54	37.4	44.9	7.5
Swedes . . .	66	90.8	93.3	2.5
Barley . . .	61	30.8	40.4	9.6
Clover-grass . . .	128	41.7	68.3	26.6
Clover-grass . . .	114	27.9	46.1	18.2

Source: *Tidsskrift for Planteavl*, 60. Binds, 4. Hefte, 1957, København, p. 650.

* A crop unit = the feeding value of 100 kg. barley.

Land reclamation and flood control

Throughout the years many hectares have been reclaimed in coastal areas, moors, lakes, &c. Because the Soil Improvement Act mentioned earlier did not cover cases where land reclamation was necessary a Land Reclamation Act was passed on 14 November 1940. Figures concerning reclamation projects completed in the period 1940-59 are given in Table 4.

Projects not stated in hectares but costing 2.7 million kroner in initial expenditure, including 1.3 million kroner in government grants, should be added to the relevant figures in the Table. The main figures are then: total acreage reclaimed, 101,060 hectares; total initial expenditure, 143.3 million kroner; and government grants, 86.4 million kroner.

According to the Land Reclamation Act a government grant has a maximum limit of two-thirds of the initial expenditure. The remaining one-third is obtainable as a loan, which is free of interest and repayment for the first three years. Thereafter 7.6 per cent. has to be paid yearly (4.5 per cent. representing interest and the remainder, repayment).

TABLE 4. *Land reclamation projects completed 1940-59*

Size group of projects ha.	Number of projects	Total acreage, hectares	Hectares per project	Initial expenditure		Government grants	
				total (1,000 kroner)	kroner per hectare	total (1,000 kroner)	per cent.
THE ISLANDS							
-10	218	697	3.2	2,063	2,960	1,217	59
10-100	237	8,731	37	17,039	1,950	10,422	61
over 100	85	29,246	344	36,028	1,230	21,564	60
Total	540	38,674	72	55,130	1,425	33,203	60
JUTLAND							
-10	116	656	5.7	1,895	2,890	1,175	62
10-100	374	13,274	35	26,495	1,995	15,890	60
over 100	128	48,456	379	57,063	1,175	34,881	61
Total	618	62,386	101	85,453	1,370	51,946	61
DENMARK							
-10	334	1,353	4.1	3,958	2,925	2,392	60
10-100	611	22,005	36	43,534	1,980	26,312	60
over 100	213	77,702	365	93,091	1,200	56,445	61
Total	1,158	101,060	87	140,583	1,390	85,149	61

Source: The Ministry of Agriculture, Copenhagen.