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### OAT BREEDING IN THE NETHERLANDS

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#### 1. INTRODUCTION

For many years oat growing in the Netherlands was based chiefly on foreign varieties. During the last few years the situation has changed owing to successful work by Dutch breeders. The present article reviews oat breeding in the Netherlands and gives information on seed production and on statistics of this cereal.

#### 2. OAT VARIETIES GROWN TOWARDS THE END OF THE PAST CENTURY

The leading varieties grown during the second half of the past century were Groninger dikke witte, Probsteier, Zwarte voerhaver and Zwarte President. Probsteier, a yellow oat, was a German land race that had spread widely in the Netherlands.

Zwarte President (Black President or Mesdag oat), an early maturing, black oat, is the only variety of this group that has remained in cultivation, because of its low lime requirements and its resistance to copper deficiency. The history of Zwarte President can be traced back to about 1860. At that time it was put on the market by J. DE JONGE, the president of a drainage-district association. For this reason the farmers called the new black oat "Zwarte President" (KOK, 7). It was grown especially in the region of the "peat colonies" (settlements on reclaimed peat moors) and on newly reclaimed fen moors or heath. Now that the nature of the deficiency disease prevalent on new land is known and the application of copper sulphate has been found to be an effective remedy, Zwarte President is not often cultivated since other varieties give considerably higher yields. In 1933 about 20,000 ha were sown with it, in 1953 about 1560 ha.

Zwarte President has also been put on the Belgian and German lists of varieties. In France DE VILMORIN brought out a selection called Avoine noire de Mesdag.

#### 3. THE FIRST BREEDER OF OATS IN THE NETHERLANDS

J. OOST ELEMA a farmer at Middelstum (Groningen) devoted himself to seed production, especially of winter barley and oats. He selected in black fodder oats among other crops. In a communication dated February 1889 (1) he reported that the second hybrid generation of white x black oats produced grains of various shapes and colours.

#### 4. THE PLANT BREEDING FARM IN THE WESTPOLDER

The basis of this breeding farm was laid by J. H. MANSOLT, one of the first settlers in the Westpolder. This land was reclaimed about 1876. Where once the waves had

free play a breeding establishment arose on fertile soil protected by embankments more than 5 m high.

J. H. MANSHOLT (1844–1914) devoted himself to producing seed of various “land races”. At first he worked with wheat, later with oats, especially with the German oat variety Probsteier. As he bestowed great care on seed growing and started from individually selected plants it is understandable that seed production soon developed into plant breeding. In assessing the merits of the progenies of the various selections differences were often observed and thus new varieties could be brought out.

The application by MANSHOLT of pedigree methods is an important event in the history of plant breeding in our country (DE HAAN, 3).

For many years MANSHOLT only selected oats, without making crosses. No doubt the difficulty of crossing oats had something to do with it. The breeding work was continued and extended by his son, Dr R. J. MANSHOLT. In the course of time many oat varieties were bred, amongst others the yellow oats Improved Probsteier (1899) and Mansholt’s haver I (1915); the white oats Mansholt’s haver II (1905), Mansholt’s haver IIa (1911) and Mansholt’s haver IIb (1912). From a cross made by the father in 1909 between Mansholt’s haver II and Svalöf’s Victory the son bred Mansholt’s haver III (1920). This variety combined the attractive grain of Victory with the stiff straw of Mansholt’s II and also gave a good yield. Mansholt’s III was maintained for many years, but received competition from two other varieties developed by the same breeder, the white oats Binder and Wodan. Binder, a selection from Carsten’s oat III, was introduced in 1931. This variety is characterized by a compact panicle and stiff straw. Binder figures also on the Belgian and French Lists.

Wodan was obtained by selection in the black oat Orion II and was entered on the List in 1941.

The latest variety produced by the breeding establishment at Westpolder is Major oat, introduced in 1952. Major is an early maturing white oat, originating from the cross Binder × Eagle made in 1932. It is distinguished by its thin husk. This variety stands in the joint names of the co-operating breeding establishments G. Geertsema & Co, Groningen; Royal Breeding Establishment & Seed Company D. J. van der Have, Kapelle-Biezellinge and Dr R. J. Mansholt’s Breeding Establishment Ltd, Westpolder.

Oat breeding – and indeed breeding work in general – at Westpolder is now executed by the youngest son Ir U. MANSHOLT.

##### 5. THE BREEDING ESTABLISHMENT OF P. J. HIJKEMA AT MENSINGEWEER (Gr.)

In 1916 P. J. HIJKEMA, a farmer in northern Groningen, started breeding crop plants on a small scale as a hobby. In the course of time this activity widened in scope and with peas, fibre flax, winter barley and oats HIJKEMA has obtained notable results.

About 1925 he released the black oat Triumph and the white oat Record. In 1939 HIJKEMA (5) reported that he was devoting himself exclusively to the improvement of white types. He selects in hybrid populations for plump grain and stiff straw maturing simultaneously with the grain.

HIJKEMA succeeded in developing the very productive Marne oat. This variety results from a cross between Echo and Eagle made in 1930. The significance of Marne oat for Dutch agriculture is shown by its rapid extension. Introduced in 1946 it occupied 3 % of the area devoted to oats in 1947, and quickly spread to cover 63 % of the

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acreage in 1953. (This means that of the 156,000 ha under oats in the Netherlands that year, 98,280 ha were sown to Marne.) This variety also figures on the Belgian List. To HIJLKEMA belongs the credit of having created oats that could rank with the Swedish varieties, which had been extensively grown in the Netherlands for many years.

The same breeder developed *Expres* oat from the cross *Eagle* × *Mansholt's III*. It is characterized by rapid growth, stiff straw, fairly early maturity and a large-sized, white grain. It was introduced in 1941 and figures also on the Belgian List.

### 6. THE BREEDING ESTABLISHMENT "CENTRAAL BUREAU" AT HOOFDDORP

The Breeding Establishment C.B. (Director: Ir C. KOOPMAN) at Hoofddorp began oat improvement in 1937 with a series of crosses in which *Flämingsgold* was one of the parents. In order to be able to start selection within the population at an early date the 9 crosses made in 1937 were raised in a greenhouse in the winter. In the winter 1938/39 an extra generation was grown in Indonesia. Thus it was possible to obtain an  $F_6$  in 1941 and to separate lines from it.

The cross *Dippe's Early* × *Flämingsgold* produced the white oat *Libertas*, which has figured on the List since 1949. The new variety *Pendek* (*Flämingsgold* × *Binder*), with very short and stiff straw, has been placed on the List for 1954.

Ir KOOPMAN (8) stated that the main problem in oats was breeding for resistance to sprouting. By including *byzantina* oats in the breeding programme he thinks that it will be possible to introduce the tendency to delayed sprouting, characterizing many races of this group, into our oat varieties.

Ir KOOPMAN is assisted in his oat-breeding work at the Central Bureau by Ir P. SCHELLING.

### 7. OTHER DUTCH OAT BREEDERS

H. B. VEERKAMP (*Nieuwe Compagnie*) selected *Preferent* from *Black President* (1916); R. J. DE VROOME (*Assen*) bred the black oat *Trenctria* (1925) from the cross *Black President* × *Victory* and the Institute of Agricultural Plant Breeding (*Wageningen*) developed *Van Citters* oat (1925).

Among the younger breeders I would like to mention the workers of the Breeding Establishment C.I.V. at Ottersum. Ir P. C. REEKERS, in charge of oat breeding, concentrates on types for sandy soils. The yellow *Civena* oat (*Eagle* × *Carsten Yellow*) produced a good impression on the trial fields and has been placed on the List for 1954.

### 8. MAINTENANCE OF OAT VARIETIES

In a previous article I gave the following particulars relative to the maintenance of *Marne* oat (DE HAAN, 4).

"The breeder P. J. HIJLKEMA, *Mensingeweer* (Gr) was so kind as to communicate to me a few data concerning the maintenance of the oat variety *Marne*. This variety originated in 1930 from the cross *Echo* × *Eagle* and was released in 1946. Almost every year about 100 of the best heads are taken from a plot of breeder seed that has developed under normal circumstances. They are threshed separately and some 50 are selected to be planted on separate plots of 4 to 5 rows, 25 cm apart, with a distance of 7.5 cm. Of these 50 first year's rows approximately one half is retained and harvested separately, and of these about 15 are selected for multiplication. The plots with the

second year's lines are from 20 to 25 m<sup>2</sup>. Of these about 10 are selected for yield determination, and on an average 8 of these second year's lines are bulked together to be increased on a field of 1.25 to 1.50 ha. The harvest may amount to 5000 to 6000 kg of seed. When all is utilized 40 to 50 ha of breeder seed are grown. Evaluating the yield of cleaned seed per ha at 3500 kg we arrive at 140000 to 175000 kg to produce in the first place foundation seed while the rest is sealed as original (registered). A small part remains as reserve (in case of eventual crop failure).

In a variety such as *Expres* developed by the same breeder, but which is not widely grown and of which consequently only little breeder seed is needed, as a rule only one of the best lines is increased to breeder seed."

Other breeders use similar methods.

The foundation seed obtained from breeder seed is inspected by the N.A.K. (General Netherlands Inspection Service) and, if approved, multiplied to original seed, which is put on the market (of course after certification by the N.A.K.).

In general it takes 6 years of multiplication from selected elite plants to original seed.

#### 9. PRODUCTION OF SEED OATS IN THE NETHERLANDS

To illustrate the procedure followed in seed multiplication in the Netherlands a survey is given in Table 1 of the number of hectares of Marne oat that were approved during the period 1946–1952. The figures show that the area devoted to seed production by growers acting independently of the breeder is much larger than the area devoted to the production of original seed by the breeder.

TABLE 1. SEED PRODUCTION OF MARNE OAT

Year	Number of hectares of Marne oat approved as				
	orig.	once grown <sup>1)</sup>	twice grown	later propagations	total
1946 . . . .	78	130	—	—	208
1947 . . . .	225	744	117	2	1088
1948 . . . .	170	2041	411	24	2646
1949 . . . .	264	2031	583	28	2906
1950 . . . .	282	3507	322	20	4131
1951 . . . .	377	3677	1045	30	5129
1952 . . . .	468	7125	707	48	8348

<sup>1)</sup> The term once grown here means seed produced by a grower acting independently of the breeder, the seed used by the grower to obtain the crop being original seed.

Table 2 presents data concerning the seed supply of Marne oat, which was put on the List in 1946. I have no figures relative to the area sown by the farmers with their own seed. Moreover only a certain proportion of the approved seed is sealed and placed on the market depending on the demand. (Seed that has not been certified may not be marketed for sowing purposes.) This table also mentions the percentages of original seed with respect to the total quantity.

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TABLE 2. SEED SUPPLY OF MARNE OAT IN THE NETHERLANDS

Year	Number of hectares requiring seed in the following year	Number of hectares for which seed was available, (multiplication rate of 25)	Sealed seed kgs	Sealed original seed %
1946	4,902	5,200	399,780	44.3
1947	18,122	27,300	2,305,013	18.7
1948	33,100	66,150	3,731,683	12.4
1949	51,430	72,650	4,786,836	14.1
1950	78,234	103,275	8,391,319	7.9
1951	88,566	128,225	9,479,734	11.0
1952	98,280	208,700	8,855,773	10.5

By virtue of the Breeder's Decree the breeder receives a royalty when seed of his variety is marketed by others. For Marne oat, for the years 1946-1952, this was as follows:

TABLE 3. ROYALTIES PAID FOR MARNE OAT (OF WHICH 90% GOES TO THE BREEDER)

1946	f 1980.—
1947	f 14268.69 (addition of 10% not included)
1948	f 18193.78 (addition of 15% not included)
1949	f 20087.13 (addition of 20% not included)
1950	f 23690.91 (addition of 25% not included)
1951	f 24383.35 (addition of 100% not included)
1952	f 23880.17 (addition of 100% not included)

On the one hand the breeder receives revenue from the sale of original seed, on the other hand he receives royalties through the intermediary of the Inspection Service.

10. EXPORT OF SEED

There is some export of oats for sowing purposes, though less important than that of other propagating material. In the table below are set out data relating to the extent of oat growing, to seed production, and to the export of oats for seeding purposes (taken from figures furnished by the Central Bureau of Statistics).

TABLE 4. AREA UNDER OATS IN THE NETHERLANDS, SEED PRODUCTION AND SEED EXPORT

Year	Area under oats in hectares	Number of hectares approved for seed	Quantities of sealed seed in kgs	Exported seed in kgs
1946	177,300	9,615	18,300,902	2,459,000
1947	163,400	14,263	24,006,644	9,888,000
1948	139,400	15,213	19,614,604	6,948,000
1949	132,400	10,459	9,991,530	97,000
1950	139,000	7,259	13,614,647	3,302,000
1951	153,400	8,418	14,517,537	4,289,000
1952	152,700	13,193	12,506,764	660,000
1953	156,000	8,573		

The main buyers were Belgium and Luxemburg; in some years also Denmark, Germany, Finland, France and Switzerland.

11. THE IMPORTANCE OF FOREIGN-BRED VARIETIES IN THE NETHERLANDS

A survey of the foreign-bred varieties with which the Dutch varieties have to compete is relevant to an article on oat breeding in the Netherlands. From 1933 onwards exact figures are available. They are published each year in the Descriptive List of Varieties of Field Crops. These figures refer to the 26 regions in which the country has been divided for statistical purposes and also to the Netherlands as a whole. The data relative to the whole country are presented below.

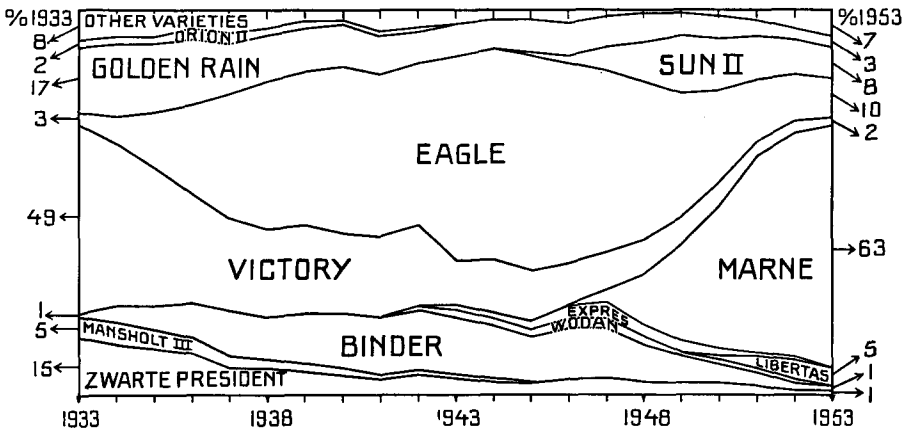


FIG. 1. DISTRIBUTION OF THE OAT VARIETIES, 1933-1953

Towards the beginning of the present century the varieties developed at Svalöf started to spread in the Netherlands. Victory (Seger) was first distributed in 1908. Fig. 1 shows that in 1933 the Svalöf varieties Victory (Seger), Eagle (Örn), Golden Rain II (Guldregn II) and Orion II together occupied 71 % of the area under oats in our country. In 1953 the Swedish varieties only covered 23 % of the area under oats. For many years Dutch agriculture has greatly benefited from these varieties. Svalöf succeeded in continually producing better varieties. Eagle superseded Victory and Sun II became the competitor of Eagle after 1945.

TABLE 5. DISTRIBUTION OF OAT VARIETIES IN 1953 IN THE NETHERLANDS

	%		%
Binder	1	Abed Minor (Danish)	3
Expres	trace	Dippe's Fr. (German)	2
Libertas	5	Eagle (Swedish)	10
Major	1	Flämingsgold (German)	trace
Marne	63	Golden Rain II (Swed.)	3
Wodan	trace	Sun II (Swedish)	8
Zwarte President	1	Victory (Swedish)	2
		Other varieties	1
Dutch varieties	71%	Foreign varieties	29%

The Danish variety Abed Minor occupied 3 % of the area in 1953 (Table 5).

At the beginning of the century the German yellow oat Probsteier was widely grown in the Netherlands, but in recent years the German oats (e.g. of the breeders STRUBE,

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VON LOCHOW, KIRSCH and DIPPE) have been of little significance in our country. The same can be said of the Scottish variety Early Miller.

Though oat breeding abroad has not come to a standstill we can state that at present foreign-bred varieties no longer occupy a dominant position in our agriculture.

### 12. THE SIGNIFICANCE OF OAT BREEDING FOR DUTCH AGRICULTURE DURING THE LAST 20 YEARS

Using statistics of 1933 and of 1953, and taking into account the relative grain production as published in the List of Varieties, we can calculate that during this interval of 21 years the improvement of the varieties used has caused an increase in yield of some 11 %. This percentage tallies with the computations made by GROENEWOLT (2), who estimates that through improved stocks there is an annual yield increase of  $\frac{1}{2}$  %.

### SUMMARY

While towards the turn of the century the German yellow oat Probsteier had spread considerably in the Netherlands a shift occurred after about 1910 in favour of Svalöf varieties. First Victory spread, later other varieties followed. Dutch agriculture has derived much benefit from these varieties.

However, oat breeding in the Netherlands developed also. In the course of years the breeder MANSHOLT produced several varieties, which together occupied about 20 % of the area under oats. To the breeder P. J. HIJKEMA belongs the honour of creating the variety Marne, which could successfully compete with the Svalöf varieties.

In 1953 Mansholt's varieties occupied 2 % of the area under oats; Hijlkema's varieties 63 %; the variety of the Central Bureau 5 % and Black President 1 %. That means that in 1953 home-bred varieties occupied 71 % of the land under oats.

The changes that have occurred in the varietal range are shown in Fig. 1.

Some of the Dutch varieties are also appreciated abroad.

### SAMENVATTING

#### *Haververedeling in Nederland*

Nadat in het laatst van de vorige eeuw de Duitse Probsteier gele haver zich sterk had verbreid in Nederland, is sedert  $\pm$  1910 een verschuiving ingetreden in de richting van de Svalöf-rassen. De Zegehaver b.v. kreeg een zeer grote verbreiding; daarna volgden andere. De Nederlandse landbouw heeft dankbaar gebruik gemaakt van de buitenlandse haverrassen.

Toch heeft de haververedeling in Nederland niet stilgestaan. In de loop der jaren zijn verschillende Mansholt-rassen gekweekt, die gedurende een aantal jaren tezamen ongeveer 20 % innamen van de in Nederland met haver beteelde oppervlakte.

Aan de kweker P. J. HIJKEMA komt de eer toe, dat hij er in slaagde de Marne haver te kweken, die in staat was de concurrentie tegen de buitenlandse rassen op te nemen.

Het Nederlandse haverareaal is thans voor meer dan de helft gebaseerd op Nederlandse rassen en verschillende daarvan vinden in het buitenland waardering. Het percentage van de Mansholt-rassen bedroeg in 1952 2 %, van de Hijlkema-rassen 63 %,

van het C B-ras 5% en van de Zwarte President 1%; in totaal was dus 71% van het Nederlandse haverareaal in 1953 bezet met Nederlandse rassen.

De verschuiving in het rassensortiment van 1933 af is aangegeven in fig. 1.

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