JOURNAL OF THE SCIENTIFIC AGRICULTURAL SOCIETY OF FILNAND
Maataloustieteellinen Aikakauskirja
Vol. 51: 210—221, 1979

Management techniques of maize crop in the marginal growing area in Finland

SEPPO PULLI
University of Helsinki, Dept. of Plant Husbandry, 00710 Helsinki 71

OSMO KARA
University of Helsinki, Dept. of Farm Engineering, 00710 Helsinki 71

P. M. A. TIGERSTEDT
University of Helsinki, Dept. of Plant Breeding, 00710 Helsinki 71

G. BRÜNINGHAUS
Wiurila, 24910 Halikko

Abstract. Silage maize management studies were carried out in 1976—78 on the University farm in Siuntio in southern Finland. Seeding time trials in 1976—77 consisted of three different types of varieties seeded at four different times between May 11 and June 8. In 1978 three seeding dates were tested in relation to the seeding depth of the maize. Population density studies were carried out in 1976—77.

As a result of the management studies it can be concluded that the weather conditions were so unfavorable that true differences could not be found because even the best alternative in the management technique did not give a satisfactory agronomic result. Seeding dates from May 15 to May 25 can be recommended. Relatively heavy frosts in early June (−4° C to −6° C) will hurt stands but they do not kill the plant. The advance earned with early planting is thus not totally lost through the frosts

Seeding depths of 5 to 7 cm are recommended. Population densities more than 10 plants/m² are not necessary for the maximum yield. In average or better than average growing conditions the planting densities of 6 to 8 plants/m² could yield a more mature forage crop.

ntroduction

With the open pollinated varieties as used in the 1930's the recommended seeding dates were at the beginning of June (VIRTANEN 1940). According to VIRTANEN's studies the recommended seeding rate was 120 kg/ha (35 plants/m²) with a row distance of 40 cm and with a seeding depth of 7—8 cm. In the seeding date trials at Tammisto Plant Breeding Station RAVANTTI (1960), the highest dry matter yields were obtained with seeding dates between May 20 and June 4 during the test years 1953—58. In Tikkurila YLLÖ (1962) rec-

ommended seeding dates from late May to early June. Seeding date should be adjusted to the soil temperature, which should be around 8 to 10° C at the depth of the seed placement. YLLÖ recommended a seeding rate of 100 kg/ha with a row distance of 40 to 50 cm and with a seeding depth of 7 to 8 cm. The recommendations of YLLÖ are similar to those of GELIN and GUSTAFSSON (1959), ÅBERG and LARSSON (1959) and LARSSON (1959) obtained in Sweden. The important point is that the plant densities in the 1930's, 1940's and 1950's were much higher than those experienced today in Europe and America.

Because of the very favorable breeding development of high yielding hybrids and the emphasis on silage quality instead of total biomass, the recommended crop densities today are only 25—30 % of those recommended earlier. In the USA the recommended silage maize population densities are 6 plants/m² which makes a seeding rate of 20—22 kg/ha (MARTIN et al. 1975). In the studies of NÖSBERGER (1971) in Zürich the total dry matter yield increased with increasing plant densities up to 14 plants/m². The grain yield reached the peak with 12 plants/m². In Great Britain the recommended seeding rates for grain yield and for silage stand are 10 and 13 plants/m² (ANON. 1974).

The management studies of maize conducted in 1976 consisted of seeding time trials, seeding depth studies and population density experiments related to the varieties best adapted to growing conditions in Finland.

Materials and methods

Silage maize trials with different management studies were carried out at the University farm in Siuntio in 1976—78. The research program consisted of the following types of experiments:

A. Seeding dates and varieties in 1976—77

	1976	1977
Experimental design	Split-plot	Split-plot
Plot size m²	48	18
Fertilizer kg/ha (15—15—15)	1000	1000
Plants/m²	10	10
Seeding depth	7	7
Row distance cm	80	80
Treatments:	Main plot	
Seeding dates I	May 14	May 11
» » II	» 21	» 20
» » III	June 2	» 27
» » IV	» 8	June 3
	Sub-plot	
Varieties 1.	*Flash*	*Flash*
» 2.	*LG 5*	LG 11
» 2.	*ACG 200*	*HIT*

B. Seeding density 1976—77

	1976	1977
Experimental design	Rand. block	Rand. block
Plot size m²	48	32
Fertilizer kg/ha (15—15—15)	1000	1000
Seeding date	May 14	May 11
Seeding depth cm	7	7
Row distance cm	80	80
Variety	LG 5	LG 5
Treatments:	Population densities	
	70 000/ha	70 000/ha
	100 000 »	100 000 »
	130 000 »	130 000 »

C. Seeding dates and depths in 1978

	1978
Experimental design	Split-plot
Plot size m²	16
Fertilizer kg/ha (15—15—15)	1000
Plants/m²	10
Row distance cm	80
Variety	CP 170
Treatments:	Main plot
Seeding date I	May 16
» » II	May 23
» » III	May 30
	Sub-plot
Seeding depth cm	3
» » »	5
» » »	7

The dry matter determinations were made by using 2 × 200 gr samples and drying the samples overnight at 100° C. The raw protein content of the research material was determined by using the Kjehldal method. The plant height measurements were made weekly during the entire growing season. Weather data represents the values obtained from Maasoja, Vihti.

Weather conditionsion

The temperature conditions of the growing seasons 1976—78 were somewhat below the average conditions for 1931—60. The mean temperature from May 1 to Sept. 27 was 12.0° C in 1976, 11.9° C in 1977 and 12.1° C in 1978 compared to 13.0° C as the long term average in the period 1931—60. Especially the July temperature did not reach the level desirable for maize growth in any of the research years. The precipitation figures 231—285 mm in 1976—78 remained somewhat below the average 298 mm for the period from May 1 to Sept. 27 in 1931—60. The stands were irrigated two times in 1976—77 and once in 1978. The degree days (Σ daily avg. °C) and effective degree days (Σ daily avg. °C — 10° C) expressed as cumulative temperature curves are pres ented in Fig. 1.

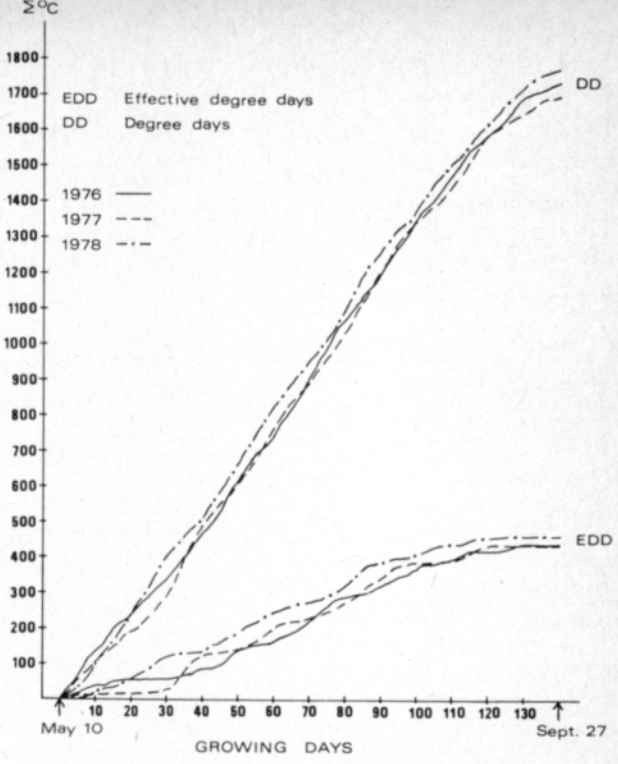

Fig. 1. The comulative temperature sum in degree days (DD) and in effective degree days (EDD) from May 10 to Sept. 27 in 1976—78 in Suitia.

Results and discussion

A. Seeding dates and varieties in 1976—77

In the tests for 1975 Flash represents a relatively early variety. Varieties *ACG 200* and *LG 5* are later maturing. In 1977 *Hit* can be considered as an early variety, *Flash* as a medium early and *LG 11* as a late variety under Finnish growing conditions. Seeding dates May 14 and May 11 represent the earliest possible seeding dates of the research years. In general the period from early May to early June is characterized by great variations of temperature from year to year. A very important point is how the varieties behave during this time.

Requirements of growing time and temperature

Although the growing seasons 1976 and 1977 were similar (Fig. 1) the seeding periods of these years were completely different. Spring 1976 was characterized by a warm mid-May, cool late May and warm early June. In 1977 the weather warmed gradually from May 11 to June 3 as can be seen from the times required for the emergence of the seedlings (Table 1). The average emergence requirements of 15 days in 1976 and 18 days in 1977 represent sprouting times obtained by Åberg and Larsson (1959) in Sweden, and Bunting and Willey (1957) in Great Britain. The amount of degree days for emergence was 191° C. The relationships between the daily average temperature and the required time in days are presented in Fig. 2. These data obtained in Suitia in 1976—77 agree completely with the findings presented by Wallace and Bressman (1937).

Table 1. Plant density at four seeding times and days from seeding to emergence, tasseling and silking and the degree days (DD) of the same growing periods in 1976—77 in Suitia.

Seeding time	Seeding-emergence		Seeding-tasseling		Seeding-silking		Plants
	Days	DD	Days	DD	Days	DD	/m²
			1976				
I 14/5	11	148	96	1 291	107	1 440	9.2
II 21/5	17	179	95	1 280	102	1 376	8.7
III 2/6	18	209	90	1 242	---	----	9.1
IV 8/6	15	178	83	1 175	---	----	7.8
Avg.	15	179	91	1 247	105	1 408	8.7
			1977				
I 11/5	22	202	99	1 334	103	1 375	8.7
II 20/5	21	191	93	1 265	95	1 290	8.9
III 27/5	16	183	--	----	---	----	8.9
IV 3/6	14	234	--	----	---	----	8.8
Avg.	18	203	96	1 300	99	1 333	8.8
			Average years				
I	17	175	98	1 313	105	1 408	9.0
II	19	185	94	1 273	99	1 333	8.8
III	17	196	--	----	---	----	9.0
IV	15	206	--	----	---	----	8.3
Avg.	17	191	96	1 288	102	13 71	8.8

Table 2. Yields of three silage corn varieties at four different seeding times in Suitia, harvested Oct. 7. in 1976

Seeding time	Variety	Yields tons/ha		
		Fresh	DM	Protein
14/5	*Flash*	36.84[a]	6.17[a]	0.61[ab]
	LG 5	34.88[a]	5.54[a]	0.59[a]
	ACG 200	38.81[a]	6.27[a]	0.71[b]
	Avg.	36.84 B	6.00 B	0.64 B
21/5	*Flash*	36.56[a]	5.80[a]	0.61[a]
	LG 5	36.97[a]	6.14[a]	0.63[a]
	ACG 200	39.56[a]	5.69[a]	0.64[a]
	Avg.	37.64 B	5.87 B	0.63 B
2/6	*Flash*	25.79[a]	3.98[a]	0.42[a]
	LG 5	28.47[ab]	4.54[ab]	0.54[b]
	ACG 200	30.87[b]	5.06[b]	0.55[b]
	Avg.	28.34 A	4.52 A	0.50 A
8/6	*Flash*	27.03[a]	4.25[a]	0.49[a]
	LG 5	28.04[a]	4.39[a]	0.54[a]
	ACG 200	29.82[a]	4.55[a]	0.55[a]
	Avg.	28.30 A	4.40 A	0.53 A
LSD .05	Times	6.0	0.70	0.08
	Varieties	5.0	NS	0.05
	T × V	NS	NS	NS

Only the first two seeding dates could produce the silking stage of silage maize in 1976—77. The average growing day requirements for silking stages were 102 days. The second seeding speeded up development by six days over the first seeding. The temperature sum in degree days (Table 1) from seeding to silking of 1371° C conforms well with the variation level of 1 232 to 1 919° C presented by SEELEY (1917).

The seeding date did not affect plant population density (Table 1). This indicates good moisture conditions during the whole germination time.

Yields and forage quality

Seeding times I and II in 1976 produced equal yields of fresh weight, dry matter and protein. The yields were significantly higher than those of seeding times III and IV (Table 3). In 1977 the trend was similar to that of 1976.

Table 3. Yields of three silage corn varieties at four different times in Suitia, harvested Sept. 24. in 1977.

Seeding time	Variety	Yields tons/ha		
		Fresh	DM	Protein
11/5	*Flash*	37.1^{a}	5.92^{a}	0.85^{c}
	LG 11	43.3^{b}	6.80^{b}	0.60^{a}
	HIT	36.3^{a}	5.70^{a}	0.68^{b}
	Avg.	38.9 C	6.14 C	0.71 B
20/5	*Flash*	37.3^{b}	5.72^{a}	0.66^{b}
	LG 11	41.8^{c}	6.68^{b}	0.81^{c}
	HIT	33.0^{a}	5.33^{a}	0.57^{a}
	Avg.	37.4 AB	5.91 BC	0.68 B
27/5	*Flash*	32.3^{b}	5.04^{a}	0.55^{a}
	LG 11	38.1^{c}	5.74^{b}	0.63^{b}
	HIT	30.7^{a}	4.51^{a}	0.51^{a}
	Avg.	33.7 B	5.10 B	0.57 A
3/6	*Flash*	28.1^{a}	4.06^{ab}	0.50^{a}
	LG 11	28.8^{a}	4.57^{b}	0.64^{b}
	HIT	25.3^{a}	3.84^{a}	0.58^{b}
	Avg.	27.4 A	4.16 A	0.57 A
LSD .05	Times	4.8	0.85	0.11
	Varieties	2.0	0.31	0.04
	T × V	NS	NS	0.08

Although the early seedings suffered from relatively heavy frosts in both springs the seeding time between May 15 and May 25 can be recommended in our growing conditions.

Seeding time affected very little the quality of the forage maize under the growing conditions in 1976—77 (Table 4). The temperature sum in degree

days only reached the level of 1700—1800° C, which is far below the level required for significant changes in the dry matter and protein content of forage. CORRALL et al. (1977) in Great Britain suggested that maize should require 2 200 Ontario heat units (CHU) before drastic changes in the plant's water content can take place. This is possible only 2 to 3 times in ten years in Finland.

The late May and early June seedings resulted in shorter plant height (Table 4). The development in relation to the degree days is presented in Fig. 3. The plant heights of early and late seedings resembled each other. The growing seasons 1976—77 were too unfavorable for any of the varieties studied to reach maturity.

Table 4. The average DM, protein and ear content (%) and plant height (cm) of three silage varieties seeded at four different times in 1976—77.

Seeding time	Content %			Plant height cm
	DM	Prot.	Ears	
		1976		
I 14/5	16.3[a]	10.6[a]	3.2[b]	233[b]
II 21/5	15.6[a]	10.7[a]	1.5[a]	225[b]
III 2/6	15.8[a]	11.1[a]	- - -	204[a]
IV 8/6	15.6[a]	11.9[a]	- - -	202[a]
Avg.	15.8 B	11.1 A	2.4 A	216 A
		1977		
I 11/5	15.8[a]	12.8[b]	5.1[b]	221[c]
II 20/5	15.4[a]	11.8[a]	3.4[a]	225[c]
III 27/5	15.1[a]	11.1[a]	- - -	203[b]
IV 3/6	15.1[a]	13.8[b]	- - -	190[a]
Avg.	15.4 A	12.4 B	4.3 A	210 A
		Average years		
I	16.1[a]	11.7[ab]	4.2[a]	227[c]
II	15.5[a]	11.3[a]	2.5[a]	225[c]
III	15.5[a]	11.1[a]	- - -	204[b]
IV	15.4[a]	12.9[b]	- - -	196[a]
Avg.	15.6	11.8	- - -	213
LSD .05 Years	0.3	0.8	NS	NS
Times	NS	1.1	0.9	8.0
Y × T	NS	NS	NS	NS

B. Seeding densities 1976—77

In the field trials in 1976—77 plant population densities of 7, 10 and 13 plants/m² were tested to observe growth and development of the crop. During the research period the seeding rate did not affect the development of the maize crop (Table 5). Under growing conditions better than those of 1976—77

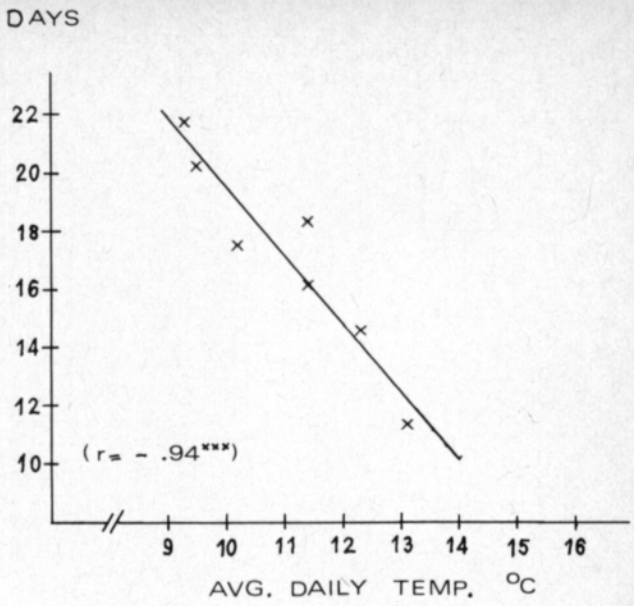

Fig. 2. Relationship between daily average temperature and emergence time in days of maize in 1976—78.

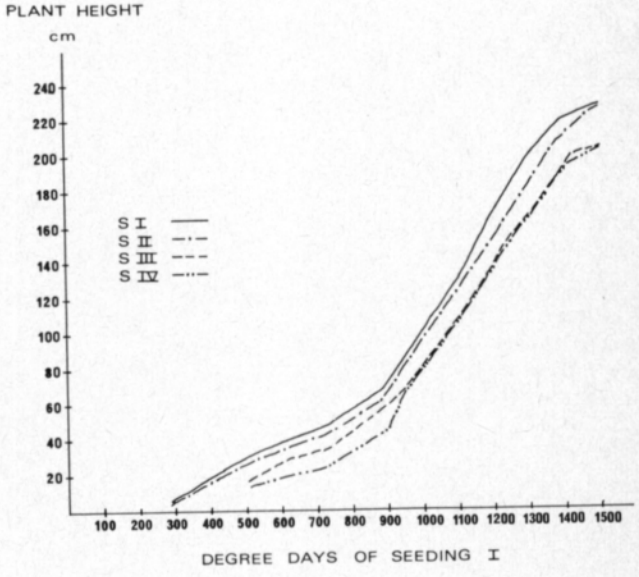

Fig. 3. The development of plant height of four different seeding times. The degree days of seeding times II, III and IV are 100, 170 and 220 °C less than seeding time I.

Table 5. Days from seeding to emergence, tasseling and silking of silage maize at three different seeding densities in 1976—77.

Seeding density Plants/ha	Days from seeding								
	Emergence			Tasseling			Silking		
	1976	1977	Avg.	1976	1977	Avg.	1976	1977	Avg.
70 000	12	24	18	99	108	104	109	112	111
100 000	12	24	18	101	108	105	109	112	111
130 000	12	24	18	101	108	105	110	112	111

Table 6. Fresh weight, dry matter (DM) and protein, yields of silage maize in 1976—77 at three different plant densities and the amount of ears (%) in the yield.

Seeding density Plants/ha	Fresh wt.	DM	Prot.
	Whole plant tons/ha		
70 000	32.6[a]	5.0[a]	0.58[a]
100 000	36.9[a]	5.7[a]	0.63[a]
130 000	37.8[a]	6.1[a]	0.66[a]
Avg.	35.7	5.6	0.62
LSD .05 Years	NS	NS	NS
Densities	NS	NS	NS
	In ears %		
70 000	3.3	3.3	5.5
100 000	2.1	2.1	3.9
130 000	1.8	2.0	3.6
Avg.	2.4	2.5	4.3

Table 7. Dry matter content (%), the content of protein (%) and the plant height in the fall of silage maize in 1976—77 at thrree different seeding densities.

Seeding density Plants/ha	% DM	% Protein	Plant height cm
	Whole plant		
70 000	15.4[a]	11.6[a]	220[a]
100 000	15.6[a]	11.1[a]	222[a]
130 000	16.2[a]	10.8[a]	223[a]
Avg.	15.7	11.2	221
LSD .05 Years	NS	NS	NS
Densities	NS	NS	NS
	Ears		
70 000	7.2[a]	19.3[a]	
100 000	7.2[a]	20.4[b]	
130 000	7.3[a]	20.8[b]	
Avg.	7.2	20.2	
LSD .05 Years	NS	NS	
Densities	NS	0.5	

more developmental differences can be expected between sparce and dense populations. The test years did not produce any differences in dry matter and protein production between the stands of different densities (Table 6).

The population densities of 7—13/m² tested in 1976—77 present significantly thinner stands than those tested by GELIN and GUSTAFSSON (1959) and ÅBERG and LARSSON (1959) in Sweden and YLLÖ (1962) in Finland. The seeding densities of the open pollinated varieties in the 1950's represent levels of 25 to 35 plants/m².

All the population densities in 1976—77 are characterized by the quality of the forage being inadequate for intensive animal feeding (Table 7). Under growing conditions beter than those of the test years one can expect with a thinner population density to harvest a lower but more mature yield than with a dense population of maize.

C. Seeding dates and depths

Because of the relatively late seeding date requirement and the very dry early summer in southern Finland the seeding depth is a very important management factor in the maize cultivation technique. In the management study for 1978 the minimum requirement for the seeding depth was 5 cm at all seeding times (Table 8). Deep seeding improved all quality characteristics of the crop. Deep seeding may delay the emergence date due to low temperature in the seed environment which should be at leat +8° C for germination (Åberg and Larsson 1959). The desirable daily mean temperature of the planting day should be at least +12.8° C (Brown 1975). This requirement can be met mostly between May 15 and May 25.

Table 8. The effect of seeding time and seeding depth on yield, quality and plant height of silage maize variety Cargill Primeur 170.

Seeding Date	Depth cm	Yields tons/ha			Content %			Plant height cm
		Fresh	DM	Prot.	DM	Prot.	Ears	
16/5	3 cm	16.1^{a}	1.96^{a}	.25^{a}	12.4^{a}	12.5^{a}	7.9^{ab}	161^{a}
	5 cm	25.6^{b}	3.41^{b}	.37^{b}	13.4^{a}	10.8^{a}	5.1^{a}	170^{b}
	7 cm	24.8^{b}	3.32^{b}	.38^{b}	13.4^{a}	11.5^{a}	13.3^{b}	171^{b}
	Avg.	22.2 A	2.90 A	.33 A	13.1 A	11.6 B	8.8 B	167 A
23/5	3 cm	16.9^{a}	2.15^{a}	.27^{a}	12.7^{a}	12.3^{b}	4.2^{a}	151^{a}
	5 cm	24.2^{b}	3.14^{ab}	.32^{a}	13.0^{a}	10.2^{a}	6.7^{a}	168^{b}
	7 cm	28.5^{b}	3.76^{b}	.37^{a}	13.0^{a}	9.7^{a}	6.1^{a}	170^{b}
	Avg.	23.2 A	3.02 A	.32 A	12.9 A	10.7 A	5.7 A	163 A
30/5	3 cm	23.5^{a}	2.85^{a}	.38^{a}	11.8^{a}	13.4^{a}	3.2^{a}	160^{a}
	5 cm	34.8^{b}	4.29^{b}	.53^{b}	12.3^{ab}	12.3^{a}	1.9^{a}	174^{b}
	7 cm	34.6^{b}	4.55^{b}	.51^{b}	13.2^{b}	11.1^{a}	2.9^{a}	180^{b}
	Avg.	31.0 B	3.90 A	.47 B	12.4 A	12.3 B	3.0 A	171 A
		Seeding depths ,Avg.						
	3 cm	18.8^{a}	2.32^{a}	.30^{a}	12.3^{a}	12.7^{b}	5.1^{a}	157^{a}
	5 cm	28.2^{b}	3.61^{b}	.41^{b}	12.9^{ab}	11.1^{a}	4.6^{a}	171^{b}
	7 cm	29.3^{b}	3.88^{b}	.42^{b}	13.2^{b}	10.8^{a}	7.4^{a}	174^{b}
	Avg.	25.4	3.27	.38	12.8	11.5	5.7	167
LSD .05	Times	6.3	NS	.12	NS	.9	2.9	NS
	Depths	4.2	.61	.07	.7	1.5	NS	5
	T × D	NS	NS	NS	NS	NS	NS	NS

Conclusions

The following results can be drawn from the study:

1. Maize can be seeded between May 15 and May 25 without any great harm from cold period in the spring. New hybrids can tolerate temperatures as low as −4° C to −8° C.
2. Seeding depths 5—8 cm are recommended for good germination and emergence.
3. Seeding densities of 10 plants/m² are adequate for high yield and good quality forage. Under better than average growing conditions a thinner population density can produce a more mature yield.
4. With conditions in which the temperature in degree days is less than 1 900° C the seeding date or variety have very little effect on a more rapid development of the stand.

REFERENCES

Anon. 1974. Farmers Weekly. Extra-Maize. Production. May 31. 1974.

Brown, D. 1975. Heat units for corn in Southern Ontario. Ministry of Agriculture and Food. Factsheet No 75—077. 4 p.

Bunting, E. & Willey, E. 1957. The emergence of maize from field sowings in Great Britain. 1. The effect of date of sowing on the extent and speed of emergence of different varieties. J. Agric. Sci. 48: 447—56.

Corrall, A., Heard, A., Fenlon, J., Terry, C. & Lewis, G. 1977. Whole crop foreages. Relationship between stage of growth, yield and forage quality in small-grain cereals and maize. Grassl. Res. Inst. Tech. Rep. 22. 35 p.

Gelin, O. & Gustafsson, H. 1959. Odlingstekniska försök med fodermajs i södra Sverige. Växtodling 11: 10—25.

Larsson, R. 1959. Inverkan av utsädesmängd och radavstånd på utveckling och avkastning av ensilagemajs. Växtodling 11: 44—53.

Martin, J., Leonard, W. & Stamp, D. 1975. Principles of field crop production. Indian corn. pp 323—382. Macmillan Pub. Co. New York.

Nösberger, J. 1971. Einflus der Bestandedichteauf die Ertragsbildung bei Mais. Z. Acker- und Pfl.bau 133: 215—232.

Ravantti, S. 1960. Lisärehukasvit. Hankkijan Kasvinjalostuslaitos. Siemenjulkaisu 1960: 156—175.

Seeley, D. 1917. Relation between temperature and crops. Mon. Weath. Rev. 45: 354—9.

Wallace, H. & Bressman, E. 1937. Corn and corn growing. 431 p. John Wiley & Sons, New York.

Virtanen, A. I. 1940. Maissin viljelyksestä ensi kesänä. Karjatalous 8. Erip. 7 p.

Yllö, L. 1962. Maissin viljelykokeista Suomessa. Maatal. ja Koetoim. 16: 101—110.

Åberg, E. & Larsson, R. 1959. Odlingstekniska försök med ensilagemajs i mellersta Sverige. Växtodling 11: 26—43.

Ms received May 3, 1979.

SELOSTUS

Maissin viljelytekniikasta Suomen kasvuoloissa

Seppo Pulli
Helsingin yliopisto, Kasvinviljelytieteen laitos, 00710 Helsinki 71

Osmo Kara
Helsingin yliopisto, Maatalousteknologian laitos, 00710 Helsinki 71

P. M. A. Tigerstedt
Helsingin yliopisto, Kasvinjalostustieteen laitos, 00710 Helsinki 71

G. Brüninghaus,
Wiurila, 24910 Halikko

Yliopiston koetilalla Siuntiossa tutkittiin vuosina 1976—78 aikaisuudeltaan erilaisten lajikkeiden käyttäytymistä ilmastossamme ja sellaista viljelytekniikkaa, joka parhaiten takaisi maissin menestymisen kasvuoloissamme.

Yhteenvetona tutkimuksista todettakoon, että sääolot tutkimusajanjaksona olivat niin epäsuotuisat, että mistään eroista ei voida puhua, koska paraskin vaihtoehto sekä kasvutiheys- että kylvöaikakokeissa antoi epätyydyttävän lopputuloksen sekä määrän, että ennen kaikkea laadun suhteen. Tärkeimpänä syynä alhaiseen 6—7 tn kg/ha satotasoon olivat alkukesän kasvun keskeyttäneet alhaiset lämpötilat sekä kasvukausien lämpötilasummien epätyydyttävä kehittyminen.

Maissin kylvöajaksi suositellaan 15—25 toukokuuta. Suhteellisen alhaiset minimilämpötilat kesäkuun alkupuolella (—4 °C — —6° C) vahingoittavat kasvustoja, mutta eivät tapa niitä. Seurauksena on pidentynyt kasvuaika. Aikaisesta kylvöstä saatua etua ei kuitenkaan kokonaan menetetä kevätpakkasissa.

Kylvö matalampaan kuin 5 cm tuottaa harventuneen, kuivuudelle alttiin kasvuston ja alentuneen satotason. Suurimpana turvallisena kylvösyvyytenä on pidettävä 8 cm. Kasvutiheydellä 10 kpl/m² saavutetaan maksimi satotaso kasvutekijöiltään normaalina kasvukautena Kasvutekijöiltään keskimääräistä suotuisampana kasvukautena saattaa alhaisempi kasvutiheys 6—8 kpl/m² tuottaa kypsemmän ja laadultaan paremman sadon.