germination was practically stopped when the soil surface temperature reached a mean of 100.5°F. Threshold temperature values seemed to be in the range of 95°F. to 98°F., but at these temperatures growth of the seedlings was severely reduced. Lower temperatures promoted better germination and growth of the seedlings. It appears that 90°F. soil surface temperature is the maximum value of proper heat protection for shade material to be used in celery seedbeds.

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COMPARISON OF TWO PLANTERS FOR SWEET CORN

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Recommended row spacings for sweet corn can be accurately followed but precise plant spacing in the row is difficult to obtain under field conditions. With 28 or 32 inch rows, plants 8 inches apart will produce high yield and good quality ears. A plant spacing fluctuating from 7 to 12 inches is obtained with the Cole planter by seeding heavily and thinning to final stand. Although this practice is the best now available, it is expensive in seed and labor. The crew, paid by the row, prefers to pull the tallest plants (easily reached) and has little regard for accuracy. However, yields have increased considerably with this practice. It is estimated that the cost of extra seed and hand thinning is $10.00 per acre. Thus, the 36,900 acres planted in the Everglades in 1962 represent a $369,000.00 expenditure. It appears however that the yield gains offset the expense.

Recently, high speed precision planters have been introduced with the claim that they plant precisely to final stand. In the spring of 1963 and 1964 the performance of a new high speed precision planter manufactured by John Deere Company was compared with the standard planter for this area manufactured by the Cole Company to determine their accuracy in final stand, yields and some quality measurements.

EXPERIMENTAL

The Cole No. 11 is a simple, rugged machine which consists essentially of an inclined rotary plate which picks the seed from the hopper as it revolves and drops them into a spout connected to the furrow opener. In addition, the seed have some forward motion which scatters them somewhat irregularly in the row, particularly at speeds greater than 2 mph. The John Deere model 495A has a plate at the bottom of the hopper to force feed the seed into a spout. This in turn is equipped with a flight chain that carries the seed down to the lower valve gate which deposits them in the furrow openers. This mechanism diminishes the inertia of the seed and permits them to reach the ground at almost zero velocity. Thus the seed can be placed quite accurately in the row at high speeds. Table 1 gives characteristics of the planters for each of the 4 experiments.

The experiments were conducted in the spring; 1, 2 and 3 in 1963 and 4 in 1964. For the 1963 experiments 16 rows one-half mile long were planted with each machine and random paired plots were established. Each experiment had 16 paired observations. In the 1964 experiment, four row plots per planter were used in a randomized plot design with 10 replications.

Hybrids Gold Cup L. Flat for experiments 1, 2 and 3 and Iobelle for experiment 4 were seeded in 34-inch rows. The tests were conducted in fields of high residual fertility following celery. No additional fertilizer was applied. Effective measures for the control of weeds, pests and diseases were performed by the grower-cooperator.

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Table 1. Working specifications of the Cole and John Deere corn planters for experiments 1 to 4.

Exp. No.	Planter	Shift lever	Drive Sprocket	Driven Sprocket	Spacing in row (in.) Tables	Intended	Actual	Speed mph
1	Cole*			12	4	8-9	9.3	2.92
1	John Deere	3	18	7	7.8	8-9	12.5	3.85
2-3	Cole*			12	4	9-10	10.6	2.92
2-3	John Deere	4	11	7	9.5	9-10	13.5	3.85
4	Cole*			12	4	8-9	9.0	2.12
4	John Deere	4	18	7	5.8	8-9	9.8	3.41

* Soybean plate with 32 pockets will space about one kernel every 4 inches.

Results and Discussion

Tables 2 and 3 present data of observations which showed significant differences between the planters. Number and weight of U.S. No. 2 ears, number of cull ears, percent of plants harvested, percent of U.S. Fancy ears, ear diameter and unfilled tip were recorded, but differences due to planters were not significant.

In experiments 1, 2 and 3 there were significant advantages with the Cole planter in plant stand and yields of U. S. Fancy ears. Furthermore, samples taken in experiment 3 showed a greater percent of U.S. Fancy ears for the Cole planter, which could indicate that careful thinning by discarding the weak plants resulted in better ears. This observation could be biased, since percent of U.S. Fancy ears was not taken in experiments 1 and 2. In experiment 4, similar results were obtained. The Cole plots produced better stand and number of U.S. Fancy ears than those of the John Deere, but the differences were smaller, indicating that experience gained during the first year helped to close the gap. No significant difference in percent of U.S. Fancy ears due to planters was found in experiment 4.

Neither planter gave the intended plant spacing (Table 1). Yields were positively correlated to stand. In experiment 4, length and number of ears per plant were significantly better with the John Deere. This indicates that Iobelle, a very prolific hybrid, tends to produce a greater number of ears at wider plant spacings.

Although the John Deere planter is a relatively high speed machine, it should be driven in muck soil at 3.5 mph or slower, and the sprocket arrangement adjusted for closer plant spacing than indicated in the manufacturer's manual. It seemed that the advantage obtained with the Cole is not related to the mechanics of the planter, but to the post-planting operation that follows. By seeding about twice the amount of seed necessary for final stand, the Cole machine gave added insurance that at thinning time, three to four weeks later, there would be enough plants to obtain the desired population. In this way, the plants had passed the critical stage at which losses are more likely to occur due to soil borne parasites, diseases and mechanical damage. Stand counts after emergence, three weeks later and at harvest showed that a larger loss of stand occurred between emergence and the 3-week period than between between the latter and harvest. One important point remains, regardless of the planter used—that stand decreases from emergence to harvest, and the good operator should apply all techniques available to reduce this loss, particularly when using the John Deere machine.

On the basis of yield data obtained in experiment 4, it is estimated that the Cole machine produced 14 crates per acre more than the John Deere, and also that the cost of extra seed and thinning for Cole is approximately $10.00 per acre. With a mean price of $2.50 per crate, a net profit of $1.00 per crate is realized by the

Table 2. Effect of two planters on mean plant stand per 33.3 feet of row and yields of Gold Cup sweet corn (1963).

Exp. No.		Cole	John Deere
1	Stand	41	32**
	Total weight (lbs.)	36.0	30.9**
	Number of U. S. Fancy ears	53	44**
	Weight of U. S. Fancy ears (lbs.)	34.8	30.7**
	Crates per acre	408	338**
2	Stand	36	28**
	Total weight (lbs.)	29.2	26.4**
	Number of U. S. Fancy ears	44	38**
	Weight of U. S. Fancy ears (lbs.)	27.8	25.8**
	Crates per acre	338	292**
3	Stand	37	27**
	Total weight (lbs.)	28.8	25.2**
	Number of U. S. Fancy ears	45	36**
	Weight of U. S. Fancy ears (lbs.)	27.8	23.7**
	Crates per acre	346	277**

** Significantly different at 0.01 level.

Table 3. Effect of two planters on mean plant stand in 50 feet of row, yields, ear length in inches and number of ears per plant of Iobelle sweet corn (1964).

	Planters	
	Cole	John Deere
Stand	67	60**
Number of U. S. Fancy ears	70	67*
Crates per acre	359	345*
Ear length (in.)	7.91	8.10*
Number of ears per plant	1.07	1.16**

* Significantly different at 0.05 level.

** Significantly different at 0.01 level.

farmer, which gives a final $4.00 net return per acre when using the Cole planter. Naturally, this price estimation scheme is not as simple as presented here. It is possible that the $4.00 net return for the Cole is even higher, if the initial cost of the machines, depreciation and repairs are taken into consideration, which in the case of the John Deere, because of its more complicated mechanism, have to be higher. To this is added the cost of close supervision and extra and timely measures for the control of soil borne parasites that should be carried out, particularly with the John Deere. However, there is one intangible asset in favor of the John Deere—elimination of the large thinning crews needed with the Cole planter. Labor is increasingly difficult to obtain and the type of performance is far from acceptable. It appears therefore that despite the yield disadvantage found with the John Deere, this planter is here to stay and it is very possible that with a little ingenuity and experience the performance of this planter could equal or even surpass that of the Cole. However, it should be kept in mind that the John Deere planter produced 25% more missing hills than the Cole. This could be due to failure of the machine to drop the seed or failure of the seed to germinate.

Conclusions

Practical suggestions for improving stand and yield as a result of this study are: 1) Start with seed of high germination and vitality. 2) The seed should be carefully graded for size. 3) A few days before planting make a calibration run after selecting the proper plates at the intended speed for the soil type to be planted, and make corrections if necessary after germination. For the Cole, use 16 to 18 pounds of seed per acre and thin to final stand. For the John Deere, the sprocket arrangement should be approximately 2 inches closer than recommended in the manual when planting in loose muck soil. 4) Plant at a maximum rate of 2.0 mph with the Cole and 3.5 mph with the John Deere, or lower. At this rather low speed the Cole is planting about 9 seed and the John Deere 8 seed per second. 5) Maintain an optimum stand by careful planning and effective control of birds, rodents, weeds, diseases, insects and mechanical damage when cultivating or spraying. 6) When using the Cole planter, have close supervision at thinning time.

Summary

The Cole and the precision John Deere planters were compared for accuracy in obtaining certain plant spacings in the row and effect on yield and appearance of the ears. The Cole planted heavily and the extra plants were thinned by hand to final stand. The John Deere seeded to final stand and no thinning was necessary.

The extra cost for seed and thinning was about $10.00 per acre for the Cole, but the yield increase gave approximately a net profit of $4.00 per acre over the John Deere. This advantage is due to better stand and consequently higher yield obtained with the Cole. However, with experience gained during the first year, a definite improvement in stand and yield with the John Deere was obtained during the second year. It is possible that improvement will continue and in the near future the performance of the John Deere may be similar to or surpass that of the Cole. Although there were indications that the percentage of Fancy ears with the Cole planter was higher in experiment 3, there were no significant differences in experiment 4.

The main disadvantage with the Cole is the great amount of manpower and close supervision needed for thinning large acreages.

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