ing color, and death, (b) a failure of florets to open and develop normally, and (c) in severe cases a floret sheath burn. Toxicity symptoms were much more pronounced on dark colored than on light colored varieties. Water uptake by spikes was less in well waters than distilled water, but did not necessarily decrease as salt content increased (Table 1). Neither acidification to pH 4.5 with HCl or H_2SO_4, 1:1 dilution with distilled water, nor addition of 3 drops per liter of a detergent-disinfectant prevented toxicity symptoms. The addition of 10 g/1 of a floral preservative failed to eliminate toxicity symptoms completely (Table 2), but floret size and water uptake increased. In all cases where the presenvative was used, however, petal color-break similar to that attributed to bean-yellow mosaic virus was accentuated. Exposure of spikes to well waters for 1 day was *sufficient* to induce severe phytotoxic effects (Table 2). In general whenever water uptake was reduced, keeping quality was reduced accordingly.

Two types of toxicity to gladiolus were apparent: (a) a specific ion effect or combination of ions, and (b) total salt content. Therefore, laboratory research is being conducted presently to determine the specific ions or ion combinations which induce petal burn in low-salt wells.

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REDUCTION OF PRODUCTION COSTS IN A GLADIOLUS FLOWER OPERATION BY SUPPLEMENTAL CORM PRODUCTION

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INTRODUCTION

Gladiolus corm production has been largely limited to the northern and western part of the United States and Holland. The term "Bulb" will be used here as in the commercial trade in place of the word corm. From the above sources the Florida commercial gladiolus grower has relied upon for bulbs over the past thirty-five years. In recent years the Florida grower with the advent of hot water treatment of bulblets has been able to produce a healthier stock of bulbs. Florida grown bulbs have several advantages over those from other sources, namely, bulbs are in the right growth cycle for winter flower production, less spread of viruses, and summer dug bulblets can be hot water treated (1).

The bulb growing operation of the company was started in the 1964-65 growing season with the bulblet crop and the subsequent planting stock crop was grown in the 1965-66 season plus another bulblet crop. Only previous literature available on cost of production of gladiolus was done in 1947-48 season on a flower crop (2), this work was recorded in man hours per acre plus tractor hours, horse hours, and truck hours. There has been a 15% reduction in man hours and still approximately the same number of tractor and truck hours. As far as can be ascertained no previous study can be found on the cost of bulblet or planting stock production. This cost study was designed with the assumption that the company could reduce their costs by producing a substantial amount of their bulb requirements.

DESCRIPTION OF ITEMS

The various items included in the study with a description of the particular item are as follows:

Preparing ground consists of all tractor work done from the time the new ground was cleared. This includes leveling, ditching, and bedding operation.

Planting includes the sowing by machine of both bulblets and planting stock and the covering of same.

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Fertilizing and spraying is also all tractor work.

Cultivation is the boarding off operation, weeding, aeration, and mowing spikes off in the planting stock.

Digging in the bulblets was by a machine that was tractor drawn. The planting stock was dug by a machine and put back on the ground and then picked up by hand.

Cleaning of the bulblets was done by derooters and graded by machine. Planting stock was cleaned by piecework and then graded by machine.

Weeding includes all hand labor on both crops and a small portion of this time includes roguing.

Hauling consists of truck expense for taking bulbs and trays from the warehouse to the field and return.

Winding cormels was done by a seed cleaner which cleans and grades all the three sizes.

Irrigation time includes the laying of feed and drain tile and the regulation of water.

Hot water treatment time includes the bagging, soaking, treating, and drying prior to cold storage.

Bagging and dipping bulblets includes the hours involved in treating with chemicals prior to planting. The planting stock was treated both prior to planting and storage.

Clearing ground includes mostly hand labor in picking up small trash and roots before planting.

Materials such as fertilizer, sprays, and dips were recorded each week and then priced out at the invoice cost.

Bulblets were charged at the market value for hot water treated stock. Eleven bushels per acre were planted.

The rent figure is prorated on a three year basis which includes bull dozer, dragline, and tractor work involved in clearing ground.

Supervision includes salaries of a full time grower plus a percentage of time spent by other foremen involved in producing the crop.

Depreciation was taken for the whole farm operation and then divided on an acreage basis for the number of acres involved in the crop.

Electricity includes a percentage of the overall charge prorated on an acre basis.

Fuel and oil was again done in the same manner.

Table 1. Labor and Material Costs for Cormel Corp-1965-66

	Man-Hours Per Acre	Cost per Acre
Prepare Ground	2.55	2.49
Planting	.91	1.13
Fertilizing	6.18	6.27
Spraying	3.63	3.96
Cultivate	7.27	6.87
Digging	36.64	31.51
Clean and Grade	130.54	138.90
Weeding	24.48	20.15
Hauling	3.36	2.81
Winding Cormels	5.60	5.03
Irrigation	3.85	8.09
Hot Water Treatment	5.27	4.75
Bag and Dip Cormels	.30	10.00
Clear Ground	10.76	10.20
Fertilizer, Dolomite		87.50
Sprays, Dips		19.90
Cormels		350.00
Rent		50.00
Supervision		72.24
Depreciation		36.90
Electricity		7.30
Fuel, Oil, and Grease		14.76
Maintenance and Repairs		39.36
Miscellaneous		21.20
	241.34	$951.32

Production Per Acre - 327,500
Cost Per 1000 - $2.90

Maintenance and repairs include costs for the whole farm plus small hand tools divided on an acreage basis.

Miscellaneous items includes taxes, telephone, social security, and other items.

Results and Discussion

Table 1 gives the breakdown on each item listed above in the bulblet crop both in man hours and cost per acre. Cost per acre could vary depending on location and the present increase in labor due in the next few months.

The total production from bulblets per acre was 327,500 bulb average for 33 acres involved in the crop. This includes all sizes from jumbo's to No. 6's. The total market value was $54,877 for the entire crop or $1662 per acre. *The production cost* for these bulbs was $31,393 or a net profit of $23,484 from this part of the bulb growing operation. These bulbs were produced for $2.90 per 1000.

The second part of the operation (Table 2) was growing the planting stock produced from the bulblets into flowering size bulbs which range in sizes from jumbo's to No. 3's. Approximately 70,000 flowering bulbs were produced per acre at an average cost of $11.84 per 1000. The total acreage involved in planting stock was 98 acres. This was only 80% production due to loss of some lots from disease and others being mixed, and a high percentage of No. 6's raises the mortality rate. The market value of the flowering bulbs was $117,649 and the cost

Table 2. Labor and Material Cost for Planting Stock 1965-66

	Man-Hours Per Acre	Cost Per Acre
Prepare Ground	2.57	3.36
Planting	6.64	6.93
Fertilizing	6.32	6.20
Spraying	3.66	4.01
Cultivate and Mow Spikes	7.81	9.05
Digging	78.77	80.43
Clean	70.70	58.04
Weeding	30.37	24.38
Hauling	23.66	19.37
Dip Stock	7.46	7.65
Irrigation	2.70	2.31
Grading	10.71	11.22
Clear Ground	10.87	10.48
Fertilizer, Dolomite		76.50
Sprays, Dips		26.50
Planting Stock		254.31
Rent		50.00
Supervision		61.95
Depreciation		36.90
Electricity		7.30
Fuel, Oil, and Grease		14.76
Maintenance and Repairs		39.36
Miscellaneous		26.27
	266.24	837.28

Production Per Acre - 70,696
Cost per 1000 - $11.84

of production amounted to $82,053 with the resulting profit of $35,596.

The company has each year purchased about $105,000 worth of bulbs over the last several years. By a combination of bulblet and planting stock crop over a two year period we were able to save our bulb bill by 30%.

In addition we have planting stocks over our needs valued at $12,320. The flowering stock would be planted on both our farms so there would be no overage unless our bulb loss can be reduced. Other factors involved, we have saved $7500 in freight and have 400 bushels of bulblets valued at $14,000 to start next year's crop. We produced $3,747 worth of flowering bulbs from the bulblet crop.

SUMMARY

For a bulb growing operation to be successful on a gladiolus flower farm it should be a completely independent operation so as not to be neglected in preference for the flower crop. This has been the case in many instances in the past. All equipment and personnel should be separated so that it can be operated independently.

The bulblet crop can be almost completely mechanized and produced for a cost of $2.90 per 1000. By increasing production per acre we would be able to offset part of the rising cost of production.

Flowering stock can be produced for $11.84 per 1000 if at least 80 percent production is maintained. Any increase above this would help maintain the increasing cost of production.

By a combination of a bulblet and planting stock crop the company was able to save 30% of the annual bulb purchases. All the surplus inventories plus freight savings amounted to $33,820.

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THE EASTER LILY INDUSTRY IN FLORIDA

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The Easter Lily industry in Florida began as a bulb crop. In the early '30's a Mr. Renniger, who lived in Bartow, was given a handful of bulbs. As they multiplied, he enlarged his garden. In about '35 or '36 the Rennigers moved to Lake Placid and brought the bulbs with them. There, on the east shore of Lake Huntley, the first commercial crop of lily bulbs was harvested.

Having a good stock of bulbs at the time of the Japanese attack on Pearl Harbor was the beginning of a success story and a new industry for Florida. These lilies were of the Creole type and as the years went on, some wild-eyed promoters renamed them from either a selection or a whim, but the only name that stuck was *Floridii.*

Rex Beach was also one of the pioneers in this area and was doing rather well until he imported bulbs from Mexico that were heavily infested with "lily fleck virus" which spread to his entire planting, and he went out of the business. The few other growers were fairly isolated, and remained clean. Soon many small acreages in the Lake Placid-Sebring area were being planted on the south and east sides of the lakes in the area. The soil in these spots was generally peat muck type with good drainage, and with a minimum of fertilizer, these growers could produce large crops of very fine bulbs. Each farm was separated enough so at first the spread of disease was due to the lack of knowledge of the diseases and how to control them, or neglect, and to be very frank, many of the growers could have cared less, as long as they could sell the bulbs. Of the 30 to 40 growers in the Lake Placid-Sebring area, only about 5 or 6 remain, producing comparatively virus-free bulbs for the early bulb market in this country, and some for foreign trade.

The USDA at Beltsville saw the potential in those early days and spent a great deal of time working with the growers. Some of this work had its drawbacks because of the distance between field and laboratory. Some of the earliest work done was by Dr. Neil W. Stuart on "The Influence of Temperature Storage Period on Forcing Lilies" 1941-42. Of course, this was

[1]H & H Lily Growers, Stuart.