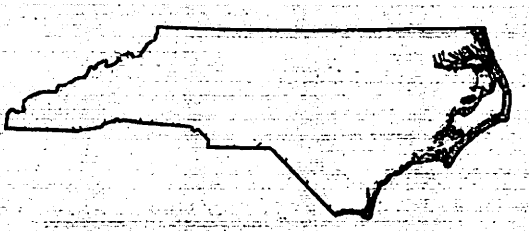
North Carolina Flower Growers Bulletin



VOL. 27 NO. 6
DECEMBER 1983

OFFICIAL PUBLICATION OF THE N. C. COMMERCIAL FLOWER GROWERS' ASSOCIATION

A Packaged Deal for a New Specialty

Robert Milks

Much has been written in the trade journals in recent years on bedding plant "plugs". Many of the articles have concentrated on advantages and disadvantages of growing plugs, while others have focused on the various seeding machines. These articles have emphasized 2 thoughts: 1; the question is not whether to use plugs, but rather, when or how to utilize them. 2; Purchasing a seeding machine is but a small part of producing high quality plugs. Many operations have now decided to produce plugs and at the same time discovered that a greenhouse adequate for older methods of seedling production becomes deficient for producing plugs. As the market for finished plugs gets tighter, managers must properly assess all the production requirements for growing plugs. Once these problems have been solved, growers can become specialists in seedling production - regardless if the plugs are bedding plants, pot plants, cut crops or vegetable (or even agronomic) field transplants.

Let's review those major production requirements: 1. **Seeding Equipment.** Choose the right seeder(s). Consider accuracy, durability, versatility, speed, required operator skill and price (in that order). 2. **Integrated Greenhouse Systems.** The key words here are uniformity and precision control. Irrigation techniques involving overhead booms and capillary mat systems combine with good media so young plants are not waterlogged, and mature plants are not too dry. Multi-zone bottom heating for germination, production and holding areas reinforce the need for superior logistics. HID lights are receiving renewed interest as moving light fixtures on a boom. This concept was introduced 10 years ago by Tony Smith of the Phytotron staff at N.C. State University. Pesticides and growth regulators are being used by growers with no research results to help make decisions, while fertilization is just beginning to get sorted out. 3. **High Quality Seed.** Plug production demands the best that breeders have to offer - high germination rates coupled with uniform and vigorous seedlings. Processing the seed has intensified with scarification, pelleting, cleaning, de-fuzzing, etc., as have packaging and storage (growers' storage included). 4. **Employees.** If you haven't yet delegated propagation to your best grower, you should

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Figure 1. Efficient handling of plugs is a necessity - just sown (left) and ready for sale (right).

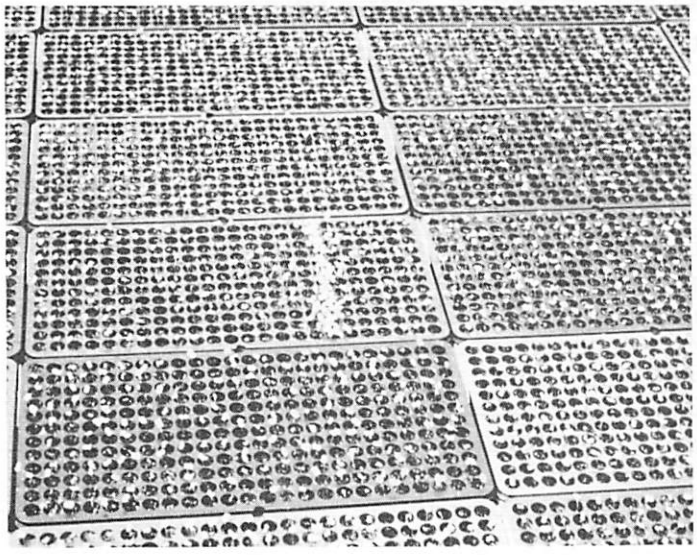

Figure 2. Seeding machine operator error. Is this a job for minimum wage?

soon do so. Also, put another sharp employee in charge of sowing - remember that sowers and growers are the heart of success with plugs. 5. **Management.** Possibly the biggest key to success with plugs is to realize how they will change the way you think about your operation. If one crop changes the way you produce plants, it will be plugs. Innovation and investment go hand-in-hand, allowing plug producers to be true specialists.

From Seeds to Seedlings

If demand is up for improved seed, we shouldn't be surprised at the increased expense. For that reason, and because we sow each seed separately, we should reconsider how we think about seed. Table 1 illustrates that we should consider the cost per seed, not the price

TABLE 1. It's the Cost Per Seed That Counts

Material	Price $/oz.	÷	Seeds /oz.	x 100 =	Price ¢/Seed
Gerbera	1,470		7,000		21.00
Geranium	462		6,000		7.70
Zinnia	154		3,500		4.40
Tuberous Begonia	50,000		2,000,000		2.50
Pansy	452		20,000		2.26
Impatiens	920		50,000		1.84
Triploid Marigold	146		9,000		1.62
Pepper	55		4,000		1.38
African Marigold	109		9,000		1.21

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TABLE 1. It's the Cost Per Seed That Counts

Material	Price $/oz. ÷	Seeds /oz. x 100 =	Price ¢/Seed
Double Petunia	1,991	255,000	1.70
Tomato	60	10,000	.60
Coleus	556	100,000	.56
Salvia	41	7,500	.55
Fibrous Begonia	8,000	2,000,000	.40
Single Petunia	1,086	285,000	.38
French Marigold	30	9,000	.34
Cabbage	23	7,000	.33
Snapdragon	570	180,000	.32
Verbena	24	10,000	.24
Ageratum	432	200,000	.22
Vinca	33	21,000	.16
Celosia	25	28,000	.09
Alyssum	10	90,000	.01

per ounce of seed. For any seed inventory, a simple calculation converts two columns of information into one which can be more easily remembered and allocated to production space. Knowing the cost per seed helps determine the way to sow and the way to grow that seed.

Let's use this information to help decide whether or not to double sow our plug flats. First, assume that finished flat cost of production is $5.00, then an average 6% seed cost is 30¢ per finished flat. Granted, not all seed costs are equal to 6% of production, but this figure is a good starting point. From Table 2 we see that the type of finished flat combines with seed costs to determine a ceiling cost for our plug flat. We then could double sow at costs less than 50% of that ceiling. We also must remember plant habit or form, machine and/or operator efficiency and germination rate when considering double sowing. From the examples in Table 3, I would say that Ageratum and Celosia can both be double sown in any finished flat size, Petunia and Begonia can be double sown if finished in a 36-pack flat and Impatiens and Geranium would never be double sown.

TABLE 2. Seed Costs Limit Use of Double Sowing

Finished Flat Size	One 288 Flat Fills	Ceiling Seed Cost/288	Consider Double Sowing When Seed Costs Less Than:
72	4	$1.20	60¢
48	6	$1.80	90¢
36	8	$2.40	$1.20
24	12	$3.60	$1.80

TABLE 3. Examples of Double Sowing Limited by Seed Costs

	$/oz	seeds/oz.	$/288 seeds	Double Sow?
Ageratum	432	200,000	.62	yes, any size
Celosia	25	28,000	.26	yes, any size
Impatiens	920	50,000	5.30	no
Petunia	1086	285,000	1.10	yes, 36 pack
Tomato	60	10,000	1.73	no

	$/1000	$/288 seed	Double Sow?
Geranium	77	22.19	no
Begonia	4	1.15	yes, 36 pack

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Knowing this, some growers have indicated that they could just buy cheap seed and double sow everything. Table 4 indicates how poor this decision is, as double sowing does not double the number of cells with plants. This table is based solely on probability under ideal conditions, i.e., the seeder delivers seed perfectly and the seed germinate in your greenhouse at the rate printed on the packet. Both are unlikely - your germination rate may be 10% lower than when germinated in the seed laboratories.

TABLE 4. Germination Distribution in Plug Flats
(Values are percentages of total cells based on probability)

Seed Germination Rate	Seedlings Per Plug 1	2	Cells with Plants	Not Germ.	Total
50% Single Sown	50	0	50	50	100
Double Sown	50	25	75	25	100
60% Single Sown	60	0	60	40	100
Double Sown	48	36	84	16	100
70% Single Sown	70	0	70	30	100
Double Sown	42	49	91	9	100
80% Single Sown	80	0	80	20	100
Double Sown	32	64	96	4	100
90% Single Sown	90	0	90	10	100
Double Sown	18	81	99	1	100
95% Single Sown	95	0	95	5	100
Double Sown	10	90	100	1	100

These figures clearly show some challenges for a grower, particularly when compared to what plug suppliers guarantee - usually 250 cells with plants in a 288 flat. That's 87% of the cells which are filled - a high figure difficult to produce but a space utilization value not so high for your most expensive bench space.

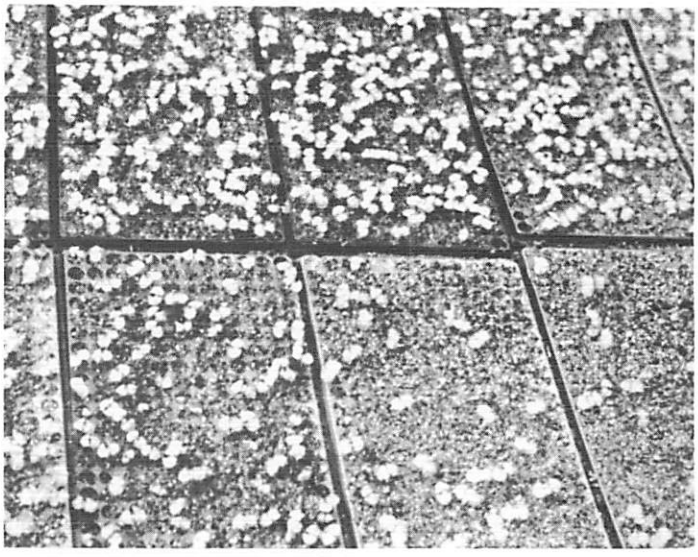

Figure 3. Understanding seed costs and germination rates help avoid scenes like this.

In conclusion, how do things look for an operation switching to plugs? Should one purchase equipment, redesign greenhouses, invest in production systems, or should finished plugs be purchased? How long can finished plug prices remain at their present level when the number of firms selling them nationally have roughly increased from 2 to 24 in just 2-3 years (with many more local firms)? Answers to these questions are difficult at best. Managers need to determine long range goals and then decide what sort of specialists they'll be - seeding and growing plugs, or buying plugs and finishing various crops.

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From a talk given at the N.C. Commercial Flower Growers' Short Course in September, 1983.

Editor's note: Robert Milks is a PhD candidate in the Department of Horticultural Science at North Carolina State University. He has been studying water relations in his thesis research for 2 years. His academic experience is complemented by 6 years of commercial experience.