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FIELD PRODUCTION OF CUT FLOWERS: A PRIMER PART II

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The first part of this article appeared in the June 1997 issue of the NCFG Bulletin and presented an overview of marketing, production costs, and information resources. Part II focuses on production culture and postharvest requirements.

PRODUCTION

The ideal site for cut flower production is in full sun with wind protection, an irrigation source, and easily accessible. Raised beds are virtually required to ensure proper drainage (unless the soil is very sandy). Beds can be any length. If offering cut-your-own, it needs to be narrow enough for customers to reach comfortably to the middle of the bed. A height of 4 to 8 inches should suffice, and drainage can be enhanced by burying drain lines 12" underneath the beds. Break up the hardpan or clay layer at least 1.5 to 2 feet deep with a subsoiler. Proper preparation of the beds is essential to optimum growth and yield. Amend beds with plenty of organic material. Well-composted horse or cow manure is excellent. Be sure it has aged to the point where weed seeds are no longer viable. Incorporate lime, superphosphate, and other nutrients as recommend by the results of your soil test. There is no excuse for guessing as to the soil nutrient content. Soil samples are analyzed at no charge by the NCDA Agronomic Services Division, Raleigh, NC [919.733.2655].

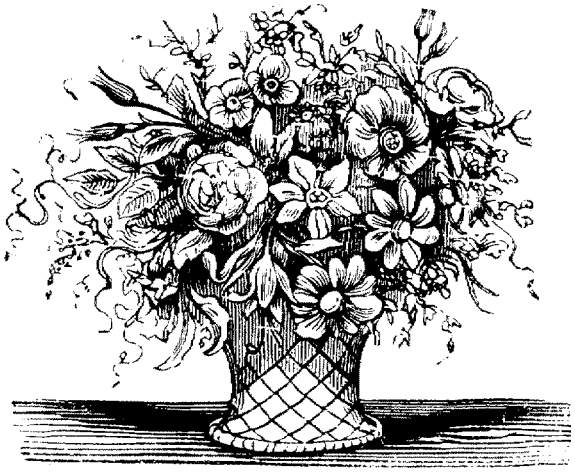
If any of the beds are to lay fallow for a length of time, such as over winter, cover crops are excellent for increasing the organic matter content of the soil and reducing erosion. Recommended fall and winter cover crops for North Carolina include hairy vetch, rye, barley, and crimson clover; or better yet, a combination of two or

more of these crops. Summer cover crops can include soybeans, cowpeas, buckwheat, and sesame.

Mulch has its proponents and detractors. Some growers insist on it for weed suppression and moisture retention. Others prefer to till between rows to control weeds. Because of the enormous variety of species grown as cut flowers, no single herbicide can be recommended.

Plant material can be acquired from a number of sources. Annuals can be direct sown into the beds or transplanted as plugs (whether bought-in or produced on-site). Some annual species should be seeded in succession to continuously produce as long as the growing season allows. Perennials are best started from plugs, whether seed or vegetatively propagated. There are many commercial sources for large plugs and starter plant liners. If perennial species are planted out in the spring, be sure they have been vernalized (cold treatment to induce flowering) if that particular species requires it in order to flower that season. For some slow-growing species, you may want to start with at least 4" to 1 gallon material. Crop rotation for annuals is a good idea. Change sites to reduce the incidence of soil-born pathogens.

Optimal spacing varies between species. What seems adequate spacing for a row of perennials the first year may result in overcrowding the following year. Dense spacing can lead to higher incidence of disease as air circulation is limited. Conversely, too much space is an invitation to weeds and reduces yield per square foot. Note that dense planting often encourage longer stems. The spacing of annuals varies by species, ranging from 4 to 6" centers to 1' x 1'. Be sure to thin rows to proper final spacing if direct seeded. Depending on the species' particular vigor, recommended spacing for perennial species range between 1' x 1' and 2' x 2', or 1' between plants and 2 to 3' between rows. Woody plants should be placed on 3 foot centers with more aggressive or larger species on 5 foot centers. Maintain moist conditions until plants are well established. Division is beneficial (or imperative) for many perennial species after the second year of production in order to maintain productivity.



Tall or relatively "top heavy" species will require stem support. Rig beds with adjustable wire or plastic netting that can be raised as plants mature. Be sure the netting and supports are in place before the plants get too tall. It's extremely difficult to "retrofit" support without damaging the plants.

Many species, such as *Phlox paniculata*, benefit from pinching to encourage branching and obtain the maximum number of stems per plant. Pinch as soon as the plants are well-established and elongating. Leaving some of the crop unpinched can result in earlier flowering and larger flowers with the trade-off of fewer stems. Consult crop-specific references for timing.

Fertilizer requirements differ from crop to crop. Some annuals, such as the annual sunflower (*Helianthus annuus*) are heavy feeders and require periodic fertilization throughout the growing season. Fertilizer delivery methods range from broadcast or side dress application of granular fertilizer to fertigation (application of nutrients through the irrigation system). Incorporation of a slow-release fertilizer during Spring (not Fall) tilling will give young plants a jump-start. Periodic on-site monitoring of soil and irrigation water pH and soluble salts will be a tremendous

help in designing and adjusting an appropriate fertilizer program. Limited space does not allow a full discussion on fertilizer sources and recommendations. Consult the cited references or your local cooperative extension service.

Pests for field grown cut flowers run the evolutionary gamut, from powdery mildew, aphids and Japanese beetles, to rabbits, deer, and unscrupulous passersby. Fungicides, pesticides and shotguns are all of use in the battle for maximum yield. IPM (integrated pest management) is highly recommended as a money-saving and environmentally acceptable pest and pathogen control methods for field cut flower production. If you are using only organic means or biological controls to produce your crop, tell your customers! Use it as a marketing edge. The Disease, Insect, and Related Pest section of the Floriculture home page web site (www2.ncsu.edu/floriculture/) offers several publications of relevance to cut flower producers concerning IPM and insect / disease identification and control.

HARVEST

Caveat: In warm weather, it is imperative that field-grown cut flowers be harvested *early* in the morning. This is not a business for those who are slow to rise or favor lingering over the morning paper… Harvest when plant water status is high and temperatures and transpiration are relatively low. Wait until dew or other moisture has evaporated, if possible. Wet flowers and foliage are more susceptible to postharvest pathogens. Do not harvest when light level and temperature is at a maximum. Shading the freshly harvested material also helps maintain lower temperatures.

Harvesting at the proper stage of development for each species is very important. Too early, and some species may not open; too late can result in drastically reduced vase life or shipability. Harvest is the most labor-intensive aspect of cut flower production. Communication with your harvest workers is essential! Be clear about what is acceptable and what isn't to insure uniformity of the product.

Field and handling sanitation is just as important as it is in the greenhouse business. Keep fertilizer injector systems, harvest knives or shears, postharvest handling buckets, surfaces and coolers clean and sanitized. Do your cutting, grading and bunching in one "fell swoop" to eliminate excess handling which can increase the cut's exposure to pathogens and water stress.

POSTHARVEST HANDLING

Proper postharvest care of your cuts is essential for maintaining high quality and a long vase life. The plant's life processes continue even after the stem is cut; respiration, transpiration, growth and development still happen. The cut stems and flowers remain sensitive to damage and disease. Floral preservatives and other additives are a necessary part of the postharvest process. Refer to specific recommendations for each species.

Cool water can serve to promote cooling of the stems. Warm water is useful if the cuts are under extreme water stress. Monitor water pH - acidic water (pH 3.0 to 5.5) inhibits bacterial growth helping flowers persist longer. Preservatives are also formulated to be effective at lower pH. Mixing your own postharvest preservative concoctions is not recommended. There are many sources for flower preservatives, conditioners, hydrators, and ethylene inhibitors.

Ethylene is another important consideration affecting postharvest longevity. Flowers cannot be stored with any kind of fruit or vegetable. The ethylene produced by the fruit or veggie will result in premature floral senescence. Good ventilation and removal of senescent flowers is essential to maintain a relatively ethylene-free environment.

GRADING, PACKING, AND DELIVERY

There is no mandatory grading system for specialty cuts flowers in the U.S. Voluntary grading standards exist for the major cut flower species as established by the Society of American Florists. General rules of thumb apply, however,

emphasizing uniformity: no greater than 10% deviation in stem length, relative uniform stem diameter, flowers of uniform size and stage of development. Ten stems per bunch is the standard for most species, with some species sold in fives or as singles.

There are myriad packing options - buckets, boxes, flowers held wet or dry; find out which are appropriate for the species you are growing. Be aware that some species such as snapdragon and gladiolus exhibit a (negative) geotropic response. Stems laid flat will bend upwards, away from the gravitational pull, resulting in curved stems.

Vehicular and personnel requirements necessary for timely deliveries are often overlooked in the planning of a cut flower business. Things can get complicated (and expensive), reducing efficiency and profits. One alternative is to delivery directly from the field in the morning. This works fine for immediate delivery to local markets. However, if you need to hold the flowers for any reason, such as accumulating certain cuts for a larger wholesale market, cold storage facilities will be necessary. There are many options available at a wide range of costs - built-in-place coolers, prefabricated cold storage units, or even modified refrigerated transportation units such as refrigerated semi-tractor trailers or ice cream trucks. If using an independent shipper, be sure your carrier is educated to the need to maintain temperatures between 35 and 40 °F during transit.

Cut flower leftovers? There are numerous ways to preserve and make use of surplus cuts - air drying, oven drying, silica gel, glycerin, etc. A number of publications include this subject - see the list of references at the end of this article.

ORGANIZATIONS

The Association of Specialty Cut Flower Growers is "the" association to join. Quarterly newsletter that accompanies membership is an excellent resource for new crop information, marketing tips, industry news and research updates. For more information, contact: ASCFG, Inc., PO Box 268, Oberlin, OH 44074, Ph. 216.774.2887.

Numerous state floriculture and greenhouse associations (often associated with the state's extension service) publish excellent newsletters. For the price of a (nominal) membership fee, up-to-date research and grower experiences can be yours! Visit your local botanical gardens/arboreta/ field trials for the first glimpse of new species and cultivars. I've mentioned this before, but the world wide web is becoming a truly useful source for contacts and information. Equipment and floral wholesalers, agricultural chemical companies, agricultural extension agencies are all entering the Internet market with gusto!

UPCOMING CULTURAL TABLE

Due to space constraints, we were unable to include a cultural summary table in this issue of the Bulletin. It will appear in the next issue. This table is an intended as an overview of some of the widest-grown species suitable for field production of cut flowers in the Southeast. Planting and bloom dates will obviously vary by zone, consult the following references for more detailed cultural and postharvest information. Some species are best suited for greenhouse production or need cooler temperatures than our growing season provides - e.g. freesia, carnation, *Gypsophila,* etc. - and have not been included in the table. The table is adapted from Armitage (1993, 1997),

Stevens (1996), and various articles from the Cut Flower Quarterly (ASFGS, Inc.) newsletters.

REFERENCES AND RECOMMENDED READING

Armitage, Allan M. 1993. Specialty Cut Flowers. The production of annuals, perennials, bulbs and woody plants for fresh and dried cut flowers. Varsity Press/Timber Press, Portland, OR Ph. 800.327.5680. *A to Z production information from the leader in discovery and development of specialty cut flower crops. Coverage by genus and species includes propagation, environmental requirements, field and greenhouse performance, harvest and postharvest, and pests and diseases.*

Armitage, Allan M. 1997. Herbaceous Perennial Plants. 2nd ed. Stipes Publishing, Champaign, IL.

Dirr, M.A. 1990. Manual of Woody Landscape Plants: Their Identification, Ornamental Characteristics, Culture, Propagation and Uses. 4th ed. Stipes Publishing, Champaign, IL. *The definitive guide to woody ornamentals in the U.S. Useful cultural information for woody plants with "specialty cuts" potential.*

Gast, K.L.B., et al., 1994. Cold Storage for specialty cut flowers and plant material (MF-1174), Cooperative Extension Service, Kansas State University, Manhattan. *How to build your own cooler!*

McAvoy, Richard J. 1997. Annuals for Field-grown Cut Flowers. Connecticut Greenhouse Newsletter 197:1–8.

Reid, Michael and Linda Dodge. 1996. Cut Flowers: Postharvest Handling Review. In: The Cut Flower Quarterly. 8(1):23–24.

Stevens, Alan. 1996. Field Grown Cut Flowers: A Practical Guide & Source book. Avatar's World Ph. 800.884.4730. *Focuses on management, marketing and production with some specific crop information, mistakes to avoid, and reams of sources and directories. Dr. Stevens is a noted cut flower specialist and consultant.*

Note that the ASCFG's national meeting will be held in Raleigh, NC, October 28–31. The conference will include workshops on growing, marketing, and what's hot, plus a great trade show. Contact Brian Whipker for more information. The author wishes to thank the countless grower contributions to the Cut Flower Quarterly that helped comprise this article.

ORNAMENTAL CABBAGE AND KALE PRODUCTION UPDATE

Brian E. Whipker, Dept. of Horticultural Science
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Raymond A. Cloyd, Purdue University, and
C. Ray Campbell, NCDA Agronomic Division

Ornamental cabbage and kale have become increasingly popular as a fall crop because of their colorful, long lasting foliage. They will often remain colorful until temperatures drop to 15 to 20 °F and are well suited to areas of the Southern US which have mild winters. Ornamental cabbage and kale are also an excellent companion crop to garden chrysanthemums and fall pansies in increasing sales. Below is an update on an earlier article run in the June 1996 NCFG Bulletin (Vol. 41, No. 3:1–5). Please refer to that issue for cultural information.

The updated information presented here includes the interpretation standards for leaf tissue samples of ornamental cabbage and kale by Dr. Ray Campbell of the NCDA - Agronomic Division (Table 1). These are the first values to be published for ornamental cabbage and kale. In addition, the latest insect and disease management strategies are listed in Tables 2 and 3. These tables were contributed by Ray Cloyd of Purdue University and Ron Jones of NC State University, respectively.

This fall Mr. Jamie Gibson will be starting his Master's degree at NC State University. He will be working with ornamental cabbage and kale as his thesis project. In addition, we have received a Fred C. Gloeckner Foundation grant to help finance the fertilization studies which Jamie will be conducting during the fall of 1999. Further updates about ornamental cabbage and kale will published over the next two years.

Table 1. Foliar concentrations of elements in ornamental cabbage and kale plants. All values are from the most recently matured leaves.

Element	Units	Adequate Range
N	%	3.5 to 4.5
P	%	0.2 to 0.6
K	%	3.0 to 4.0
Ca	%	0.5 to 1.0
Mg	%	0.2 to 0.4
Na	%	<1.0
S*	%	0.2 to 1.0
B	ppm	20 to 40
Cu	ppm	3 to 10
Fe	ppm	50 to 300
Mo	ppm	0.1 to 2.0
Zn	ppm	20 to 75

Source: C. Campbell, NCDA - Agronomic Division.

**The N:S ratio should be between 10 and 15. Ratios above 18 are considered high and indicate a need for sulfur.*

Table 2. Common insect pests of ornamental cabbage and kale.

Insect	Management Strategies
Aphids	
Aphids use their piercing-sucking mouthparts to remove plant juices. They may also inject toxins into plants. Aphids secrete a clear, sticky liquid called honeydew. Honeydew serves as a medium for black sooty mold fungi, which can reduce photosynthesis and crop marketability. Aphids are generally located on leaf undersides. They are usually wingless, but they can be winged under high populations. Aphids can increase in large numbers within a short period of time due to their ability to give birth to live young.	• **Cultural:** Inspect plants regularly for the presence of live aphids, old cast-skins, and/or honeydew. Remove all leaf debris and weeds from the area. • **Chemical:** Acephate (Orthene), Bifenthrin (Talstar), Chlorpyrifos (Duraguard), Diazinon (Knox-Out), Endosulfan (Endosulfan), Horticultural oil (Sunspray Ultrafine Spray), and Insecticidal soap (M-Pede/Insecticidal Soap). • **Biological:** Predators such as ladybird beetles and lacewings. Apply early, before aphid populations are high. Consult biological control supplier catalogs for availability of natural enemies.
Caterpillars	
Diamondback moth larvae feed on all plant parts, but prefer the undersides of older leaves. They chew small holes on leaf undersides, giving the plant a shot-hole appearance. Larvae feeding on the growing points of small plants can cause stunting. Large populations can cause considerable damage to small plants.	• **Cultural:** Inspect plants regularly for the presence of larvae and/or larvae damage. Use yellow sticky cards to monitor adult (moth) activity. Remove leaf debris and weeds from the area. This removes potential overwintering sites. • **Chemical:** Azadirachtin (Azatin), *Bacillus thuringiensis aizawai* (Xentari), *Bacillus thuringiensis kurastaki* (Dipel), Bifenthrin (Talstar), Lambda-cyhalothrin (Topcide), and Permethrin (Astro). • **Biological:** Parasitic wasps such as *Trichogramma* can be used against cabbage looper and imported cabbbageworm. Consult biological control supplier catalogs for availability of natural enemies.
Cabbage looper larvae eat irregular holes in leaves, and feed on leaves in the head region causing stunted growth. Small larvae feed primarily on the undersides of leaves. Older larvae feed deeper within the plant canopy, burrowing through several layers of leaves. This means that control should be implemented when larvae are small. These caterpillars move with a characteristic "looping" motion.	
Imported cabbageworm larvae eat large irregular holes in leaves and burrow into heads causing stunted growth. Damage is similar to cabbage looper. Larvae usually feed on upper leaf surfaces near the midrib. They generally don' t feed on large veins. Extensive feeding can kill small plants. Older larvae can burrow into the center of plants.	
Flea Beetles	
Flea beetle adults chew small, circular holes or pits in leaves. Flea beetles may cause plant stunting if they are present in large numbers. They can be particularly serious on small plants. Larvae are located in plant medium. Flea beetle adults come in various sizes and colors, but they all have enlarged hind legs that allow them to jump considerable distances when disturbed.	• **Cultural:** Remove all leaf debris and weeds from around the area. This may help to reduce flea beetle populations. Avoid placing plants near other crucifers (i.e. cauliflower and broccoli). • **Chemical:** Azadirachtin (Azatin), Bifenthrin (Talstar), Carbaryl (Sevin), Chlorpyrifos (Duraguard), Cyfluthrin (Decathlon), and Lambda-cyhalothrin (Topcide).
Whiteflies	
Whiteflies remove plant fluids with their piercing-sucking mouthparts. Their feeding can cause plant stunting and leaf distortion. Whiteflies are generally located on the undersides of leaves. Whiteflies produce a clear, sticky liquid called honeydew. Honeydew serves as a medium for growth of black sooty mold fungi, which can reduce photosynthesis and crop marketability.	• **Cultural:** Inspect plants regularly, look at leaf undersides for the presence of young whitefly stages. Use yellow sticky cards to monitor for whitefly adults. Remove leaves heavily infested with whitefly young. Dispose of leaves in plastic bags. Remove all leaf debris and weeds from the area. • **Chemical:** Acephate (Orthene), Bifenthrin (Talstar), Endosulfan (Endosulfan), Fluvalinate (Mavrik), Imidacloprid (Marathon), and Insecticidal soap (M-Pede/Insecticidal Soap). • **Biological:** Parasitic wasps such as *Encarsia formosa*. Predators such as lacewings. Apply early, before whitefly populations reach high numbers. Consult biological control supplier catalogs for availability of natural enemies.

** Mention of chemical trade names does not constitute an endorsement. Omission of any registered chemicals does not imply criticism.*

Table 3. Common diseases of ornamental cabbage and kale.	
Disease	**Management Strategies**
Alternaria Leaf Spot (*Alternaria* spp.)	
This fungus causes small, round, brown lesions on infected leaves and oval or elongated lesions on stems. These lesions may enlarge to the size of a dime. They are characterized by the presence of concentric rings within dead tissue.	• **Cultural:** Inspect plants regularly for the presence of disease symptoms. Minimize leaf wetness for prolonged periods. Remove plant debris from the area. Keep plants on schedule with transplanting and fertilizer applications. Sell plants promptly. • **Chemical:** Chlorothalonil (Daconil 2787), Iprodione (Chipco 26017), and Mancozeb (Protect T/O).
Black Rot (*Xanthomonas campestris* pv. *campestris*)	
The initial infection of this bacteria is the presence of small, yellow to light brown patches at the margins of leaves. Later, black veins develop within the yellow areas. Affected areas dry out, leaving a triangular-shaped lesion on the leaf margin. Older infected leaves can drop from plants. Cross-sections of infected stems cut near the substrate surface will show distinct rings of black tissue.	• **Cultural:** Use disease free seed. Remove infected plant debris and weeds from the area. Minimize leaf wetness for extended periods.
Club Root (*Plasmodiophora brassicae*)	
This soil borne fungus causes a club shaped swollen gall on the roots. This disease occurs in fields with a history of crucifer production and should not occur in greenhouse production with soilless substrate.	• **Cultural:** Use clean substrate.
Downy Mildew (*Peronospora parasitica)*	
Downy mildew is a water mold fungus that causes purplish irregular spots on leaves. These spots later enlarge and turn a light brown to yellow. A grayish-white fluffy growth can develop on leaf undersides early in the morning. Severe leaf and/or stem infections can stunt plants. This disease is favored by cool, wet weather conditions, and high humidity. It is also favored by long periods of leaf wetness.	• **Cultural:** Inpect plants regularly for the presence of disease symptoms. Remove infected plant parts. Maintain good air flow. Avoid crowding plants together. Avoid splashing water. Minimize leaf wetness for extended periods. • **Chemical:** Mancozeb (Protect T/O) can be used as a protectant.
Fusarium Yellows (*Fusarium oxysporum conglutinans*)	
This fungus causes plants to have a dull cast. Lower leaves turn yellow-green in color. Symptoms may appear on one-side of the leaf and/or plant. Entire plants can wilt and die. This is a soil borne pathogen that occurs in fields where cabbage and other crucifers have been grown. It should not occur in greenhouse production with soilless substrate.	• **Cultural:** Use clean substrate.
Rhizoctonia Stem Rot (*Rhizoctonia solani)*	
This fungus, which is also called wire stem, causes a brown, dry, sunken stem rot at the soil line that results in a general root destruction. As a result, roots are unable to take-up water and/or nutrients. Roots, which are normally light-brown in color, turn a dark-brown to black. If the disease starts on older plants, the stem may not be completely killed. Such plants can be stunted and/or wilted. Leaf yellowing may also occur.	• **Cultural:** Start with clean medium. Avoid splashing water. Discard infected plants. • **Chemical:** Iprodione (Chipco 26019), PCNB (Terraclor), Thiophanate-methyl (Cleary's 3336), and Triflumizole (Terraguard).
Root Rots (*Pythium* and *Phytophthora*)	
These soil-borne fungi attack the root system causing plant wilting, stunting, and leaf yellowing. Roots cannot supply adequate amounts of water and nutrients to top growth. Phytophthora is much less likely to occur than Pythium.	• **Cultural:** Avoid overwatering plants and use a well-drained substrate. Don't let plants sit in water. Use clean soilless medium. • **Chemical:** Etridiazole (Truban), Etridiazole + Thiophanate-methyl (Banrot), and Mefenoxum (Subdue Maxx).
** Mention of chemical trade names does not constitute an endorsement. Omission of any registered chemicals does not imply criticism.* *** If you are unsure of a problem, consult your Cooperative Extension office and/or call a diagnostic laboratory.*	

Cost of Producing Ornamental Cabbage and Kale

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Profitable production of ornamental cabbage and kale is dependent upon the knowledge and control of production costs. A grower who understands production costs will be better prepared to make decisions on the optimal number of plants to produce and to help establish prices. The costs presented here should be useful to current growers who wish to compare their own production expenses and for potential growers in determining whether to begin growing ornamental cabbage and kale. The data was collected from 2 North Carolina growers who specialize in producing high quality ornamental cabbage and kale plants. Each grower produced >3,000 pots and has developed market outlets which demand a high quality crop and the garden centers they sell to are willing to pay a higher price for quality. Costs are calculated for the 1998 growing year.

Costs: variable versus fixed. Costs can be categorized as either variable or fixed. Variable costs, also called direct costs, are costs that are incurred directly by growing the crop. Variable costs items are the basic inputs required to grow a crop, such as pots, plants, substrate, or chemicals. These items' costs are easy to allocate to a specific crop because you know the materials used to produce the crop and production practices you followed. The direct costs are $0.83 per pot (Table 1).

Fixed costs, also called overhead or indirect costs, are incurred whether or not a crop is produced. They include items like management salaries, depreciation, insurance, interest, repairs, and taxes. Fixed costs represent general operation expenses present in every greenhouse facility. These costs are usually the hardest to determine and to equitably allocate to each crop grown. In general, for greenhouse operations, fixed costs are allocated to a crop on a cost-per-square-foot-per-week basis. Because ornamental cabbage and kale are grown outdoors, fixed costs were allocated to the crop on a percentage basis, based on: 1) the actual use of a piece of equipment or 2) as a percentage of sales. The remaining percentage not allocated to the crop would then be allocated to the other crops produced like garden mums, bedding plants, or poinsettias.

Fixed costs are only $0.12 per pot (Table 2). The depreciation expense is fairly low and can be attributed to this firm's reliance on used equipment and because ornamental cabbage and kale share of the overall expenses are low because it represents 0.1% of the operations total sales. Firms which purchase new machinery and equipment will have a higher depreciation expense.

The overhead operation expenses represent the total miscellaneous operating expenses of the firm. The costs included in this budget are generalized and costs will vary greatly among firms. Only 0.1% of these expenses were allocated to ornamental cabbage and kale.

Shrink. Even under the best production practices, a certain percentage of the crop will not be marketable due to poor growth, insects, disease, or damage. The cost of inputs for these nonmarketable plants have to be accounted for by the operation. This is done by adjusting the production cost by a shrink factor. In this case, a 3% shrink was calculated which involved dividing the total production costs by 0.97 to get the total

Table 1. Variable costs for producing ornamental cabbage and kale in 8" mum pans. Based on 3000 pots.

ITEM	AMOUNT	TYPE	COST EACH	TOTAL COST	COST PER POT
Direct Items					
Plugs	3000	350 cells	$0.05	$150.00	$0.0500
Substrate	3000	soilless	$0.33	$990.00	$0.3300
Pot	3000	8" mum pan	$0.13	$390.00	$0.1300
Fertilizer	9	$Ca(NO_3)_2$	$13.50	$121.50	$0.0405
Fertilizer	6	KNO_3	$11.00	$66.00	$0.0220
Fertilizer	3	Excel 21-5-20	$20.00	$60.00	$0.0200
Insecticide	60	oz Thiodan	$0.57	$34.20	$0.0114
Fungicide	38	fl oz. Cleary's 3336	$1.43	$54.34	$0.0181
Growth Retardant	1.1	pounds B-Nine	$71.00	$78.10	$0.0260
Land	0.12	acres	$100.00	$12.00	$0.0040
			Subtotal	**$1,956.14**	**$0.6520**
Labor					
Transplant in pot	30	Hours	$8.00	$240.00	$0.0800
Fert./Water/Care	12	Hours	$8.00	$96.00	$0.0320
Apply Pesticides	5	Hours	$8.00	$40.00	$0.0133
Growth Retardant	1	Hours	$8.00	$8.00	$0.0027
Irrigation/Cloth Set-up	10	Hours	$8.00	$80.00	$0.0267
Subtotal				**$464.00**	**$0.1547**
			Subtotal Variable Costs (Variable Items & Labor)	**$2,420.14**	**$0.8067**
Interest on Variable Expenses (Total Direct Expenses × 9% interest × 0.33 years)				$71.88	$0.0240
			TOTAL DIRECT COSTS	**$2,492.02**	**$0.8307**

production costs (including shrink). Total production costs will increase for growers who have a higher percent of shrink.

Total production costs per pot, including a 3% shrink and costs for marketing the crop was $1.21 (Table 3).

Profitability. By adding the total variable costs and total fixed costs together, this provides the total costs of producing ornamental cabbage and kale. The profitability of the crop is directly related to the price received. The profitability per pot of a delivered ornamental cabbage and kale was $1.04 (a 46% profit margin). A 46% profit margin is a good return for the crop. This high return is due in part because the two growers

(Text continued on Page 12)

Table 2. Fixed costs for producing ornamental cabbage and kale in 8" mum pans. Based on 3000 pots.				
ITEM			**TOTAL COST**	**COST PER POT**
Items Specifically Allocated to the Crop (Depreciation)				
Weed matt, irrigation system			$80.00	$0.0267
		Subtotal	$80.00	$0.0267
Percentage Allocated Equipment (Total Annual Depreciation)	Total	Percent Assigned		
Sprayer - Hydraulic	$80.00	0.1%	$0.08	$0.0000
Delivery Truck - Used (2)	$9,600.00	0.1%	$9.60	$0.0032
Tractor - John Deere	$200.00	0.1%	$0.20	$0.0001
Shipping Racks (18)	$540.00	0.1%	$0.54	$0.0002
Smith Fertilizer Injector	$170.00	0.1%	$0.17	$0.0001
Potting System Machinery	$1,205.00	0.1%	$1.21	$0.0004
		Subtotal	$11.80	$0.0039
Interest on Capital Equipment (Total annual equipment costs × 9%)			$8.26	$0.0028
Repairs on Capital Equipment (Total annual equipment costs × 3%)			$2.75	$0.0009
Overhead Operation Costs	Total	Percent Assigned		
Management Labor	$50,000.00	0.1%	$50.00	$0.0167
Taxes and License	$14,350.00	0.1%	$14.35	$0.0048
Insurance	$7,650.00	0.1%	$7.65	$0.0026
Utilities : Telephone	$3,600.00	0.1%	$3.60	$0.0012
Utilities : Electricity / Fuel	$39,700.00	0.1%	$39.70	$0.0132
Mortgage	$7,980.00	0.1%	$7.98	$0.0027
Misc. Costs	$29,700.00	0.1%	$29.70	$0.0099
Social Security - Management	$500.00	15.0%	$75.00	$0.0250
Social Security for Hired Labor	$499.00	7.65%	$38.17	$0.0127
		Subtotal	$266.15	$0.0887
		TOTAL FIXED COSTS	$368.96	$0.1230
		TOTAL PRODUCTION COSTS	$2,860.98	$0.9537
		3% Loss (shrink = [Total Costs ÷0.97] - Total Costs)	$88.48	$0.0295
		TOTAL PRODUCTION COSTS (including shrink)	$2,949.47	$0.983

Table 3. Total costs and revenue analysis for ornamental cabbage and kale. Based on 3000 pots.

ITEM		TOTAL COST	COST PER POT
TOTAL COSTS - NON-DELIVERED PLANTS		$2,949.47	$0.983
MARKETING EXPENSES - DELIVERED PLANTS Delivery Cost (Labor and Expenses) ($0.225 × 2,910 plants)		$654.75	$0.225
TOTAL COSTS (DELIVERED)		$3,604.22	$1.208
REVENUE			
WHOLESALE: Non-Delivered & Delivered (2,910 plants at $2.25)	$6,547.50		
NET PROFIT			
TOTAL NET PROFIT		$2,943.28	
PER POT - NON-DELIVERED			$1.267
PER POT - DELIVERED			$1.042
NET PROFIT MARGIN ANALYSIS	DESIRED NET PROFIT MARGIN	REQUIRED PRICE PER POT	
		NON-DELIVERED	DELIVERED
	20%	$1.23	$1.51
	25%	$1.31	$1.61
	30%	$1.41	$1.73
	35%	$1.51	$1.86
	40%	$1.64	$2.01
	45%	$1.79	$2.20
	50%	$1.97	$2.42
	55%	$2.18	$2.68

specialize in producing high quality ornamental cabbage and kale plants and they have developed market outlets which demand a high quality crop and their customers are willing to pay a higher wholesale price for quality.

Using the method outlined will enable ornamental cabbage and kale growers the ability to compare the profitability of their crops for their own operation. Of course costs will vary among greenhouses according to their amount of capitalization in equipment and structures and their ability to purchase inputs at lower costs. Therefore, each operation will need to calculate their specific production costs in order to determine their own profitability.

The author wishes to thank the two North Carolina grower who were willing to share their time and production cost information. Their cooperation made this production budget possible.

A Note From the Editor

Douglas A. Bailey

During the past eight years, I have served as editor for the North Carolina Flower Growers' Bulletin. It has been one of the most rewarding projects I have ever undertaken. Each issue has been a new challenge where the goal was to maintain the level of excellence set by Roy Larson and perhaps even raise the standard a bit more for the next editor.

As is often the case in an academic setting, change offers new opportunities and new challenges. Since Roy's retirement in 1996, my responsibilities have shifted to include teaching two of our floriculture courses, Greenhouse Management (HS 440) and Production of Floricultural Crops (HS 442). In 1998, Brian Whipker joined our faculty, and Brian has taken over the majority of the floriculture extension responsibilities within our department. Effective 1 July 1998, my responsibilities once again shifted to include an interim appointment as our departmental extension leader. As with most additions to responsibility, something must be taken away; my choice was sanity or something else. The challenge and satisfaction of putting this Bulletin together will be sorely missed, but my wife will appreciate my decision to try to keep my sanity and give up being editor instead.

You will be pleased to know that Brian will be taking over as editor of the Bulletin, beginning with the next issue. Brian has been writing articles for the Bulletin even before arriving in North Carolina. He will definitely continue the tradition of this publication set by Roy. My only reservation about this transition is that Brian gets to harass me about meeting print deadlines. However, I'm sure he'll do it in a much more sensitive manner than I did. Thank you for the opportunity to serve the North Carolina Commercial Flower Growers, and please help me in congratulating and supporting Brian as the new editor of your Bulletin.

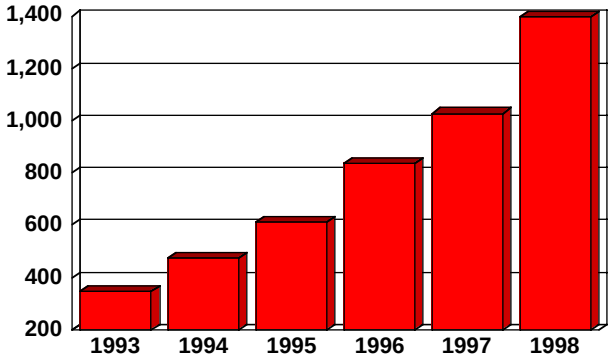
Calendar of Events

Event	Date	Time	Location and contacts
Specialty Cut Flower Growers Conference	Wednesday–Saturday 28–31 October		Raleigh, N.C. Contact ASCFG at 216.774.2887 for more information.
Finalizing the Poinsettia Crop Workshop	Tuesday 15 September **AND** Tuesday 6 October		Cunningham Research Station, Kinston, NC Catawba County Cooperative Extension Center, Newton, NC Contact Brian Whipker at 919.515.5374 for more information.
NC State University Poinsettia Open House	Thursday 3 December **AND** Sunday 6 December	9:00 am to 3:00 pm 1:00 pm to 4:00 pm	Horticulture Field Laboratory, Raleigh, N.C. Contact Bonnie for more details. Horticulture Field Laboratory, Raleigh, N.C. Contact Bonnie for more details.

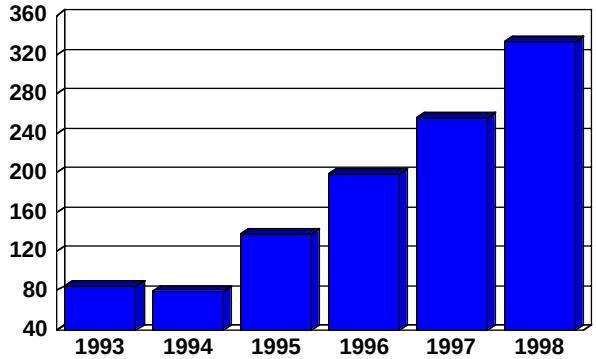
NCCFGA News

It seems as though summer just began a few weeks ago. Now its rapidly coming to a close as greenhouses across North Carolina slowly fill with over 4.5 million poinsettias for the 1998 holiday season.

Since the June issue of the Bulletin, the Southeast Greenhouse Conference and Trade Show was held. There were 1,398 attendees (2,147 total participants) at this year's show. That's a 36% increase over the 1,028 total attendees in 1997. North Carolinians comprised 360 (26%) of the attendees at the 1998 show; hopefully you were among them. The trade show increased from 285 in 1997 up to 334 booths in 1998; that's a 17% increase. Our participation on the show board and as a cosponsoring state allowed over $11,000 to be donated to NCCFGA from SGCTS this year. This money is used for association projects such as funding research, supporting of the bedding plant trials, and sponsoring refreshments for the poinsettia open house.



Number of attendees at the Southeast Greenhouse Conference and Trade Show since the first show in 1993.



Number of trade show booths at the Southeast Greenhouse Conference and Trade Show since the first show in 1993.

The Bedding Plant Field Day also took place since the last issue of the bulletin. There were 226 registered for this year's field day, and as usual, everyone enjoyed the cool July weather while touring the gardens -- fortunately without rain. The 1998 annual membership meeting was held during the field day, and your new officers and board members were elected. Many thanks are expressed to outgoing past-president Jerry Whitley; president (now immediate past-president) Joe Stoffregen; and outgoing board members Sandy Cruise, Bernie Van Essendelft, and Hyman Young, Jr. The efforts of these and all of the board members are crucial to the survival of this association. We also welcome newly elected president Craig Leonard; president-elect Sam Franklin; reelected secretary / treasurer Steve Mercer; and new board members Debbie Hamrick, Rick Icenhower, Bob Luther III, and Wilma Penland. Thank you for agreeing to serve our association. The next meeting of the board will be Thursday, 15 October at 11:00 am at the Farm Bureau Building in Raleigh. Current projects of the board include the 1998 poinsettia open house, the program for the 1999 Green and Growin' Show and plotting the future course of NCCFGA.

This year, there will be two "official" poinsettia open house dates -- Thursday, 3 December (9:00 AM to 3:00 PM) and Sunday 6 December (1:00 PM to 4:00 PM). However, world-class refreshments will only be available during the Thursday open house period and will be sorely missed by those not in attendance.

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