PROFITABLE CUT FLOWER PRODUCTION AND MARKETING Paul Sansone and Susan Vosburg, Here & Now Garden, Gales Creek, Oregon

CUT FLOWER MARKET

The cut flower market for the United States was estimated by the USDA to be over \$12.7 billion in 1991. This figure has continued to rise to an estimated \$14 billion in 1992. The cut flower industry has enjoyed an annual growth in recent years of 15-20%. The market has the potential to grow much further. The United States per capita consumption of cut flowers is approximately 10 stems per year. In Europe the per capita consumption of cut flowers is 7 to 11 times greater. A few years back very few people felt Americans would pay \$2.00 a cup for European style espresso and today even the BP gas station in my rural community in Oregon has it!

So how big is the cut flower market compared to the traditional market of this Association? The 1991 market for herbaceous perennial plants was estimated by a study to be between \$66 to \$150 million (Voigt,1991). So the potential to capture a part of the increasing cut flower market is great. The market is huge by comparison, and I feel there is unlimited potential for different products in this market.

Just as gardeners and landscape designers have become more sophisticated in their tastes and demanded a wider palette from which to choose, the same is true for cut flowers. The consumer is tired of the standard production found in FTD style florist arrangements. The most successful flower retailer in Portland, Oregon, is a European style bucket shop in the front of a supermarket. The consumer can pick up flowers by the stem or bunch, buy a ready made bouquet, or create their own after buying their groceries. Vancouver British Columbia, is filled with similar corner "bucket-shops." The North American market is moving closer to its European roots.

How the consumer buys cut flowers is also radically changing. Today over 60% of the cut flower market is outside the traditional flower shop. Mass marketers have captured a significant portion of the market through supermarket sales. Mail-order firms are sending flowers to the door of the customer via next-day air freight. The street corners and malls are sprouting flower carts.

This is no market for the faint-hearted. The wholesale market for herbaceous perennials is a cozy, established distribution network compared to the cut flower market. Competition is fierce and contracts for product are rare. The majority of the market is completely speculative. The price of a given flower bunch is determined by market forces at play the day it is cut! Prices have and do fluctuate wildly. It is very easy for a small nondiversified grower to be crushed by the larger market players.

The cut flower market is global. The price of flowers is influenced by large imports of product particularly from the Netherlands and Colombia. In the computer industry they have a saying: "the flip side of a problem is an opportunity." This is certainly true in the cut flower market. Traditional florist staples are becoming more and more dominated by imports. The United States has lost most of its carnation and chrysanthemum growers to Colombian producers. Roses seem to be the next expansion area for foreign producers.

PERENNIAL CUT FLOWERS

Where do herbaceous perennials fit in? I feel many are a perfect competitive fit for how the market is expanding. I believe there is a niche for different flowers which only grow in colder climates. These flowers fulfill the consumer's desire for something different and avoid the competition from lower priced imported product. The downside of this market is that most production occurs when wholesale flower prices are at their lowest, the summer. The cut flower market in the United States is very holiday driven. For the market to expand, and for perennial cut flowers to be in demand, cut flower sales that are not holiday driven must be nurtured. Flowers must become marketed as an everyday affordable luxury.



The vase and the garden are closer together than most people realize. What the consumer sees in floral arrangements often fuels their desire to grow some in their garden. Conversely, the consumer wants to see more variety in floral arrangements reflecting what they know can grow in fine gardens.

What are some possible niches for the perennial plant grower? I believe that as more domestic growers move away from traditional crops because of shrinking margins eroded by cheap imported product, there will be a surge in the demand for the sale of divisions to cut flower growers. These sales will be different from current garden center or wholesale nursery sales. The purchases will be in much larger numbers and the unit cost must be lower.

If this niche is to develop, the vast wealth of misinformation out in the perennial division catalogs about the suitability of plants for cutting must be corrected. Most plants listed as "good cut flowers" in even the best catalogs, are flowers that will stand up in a vase if you walk out into the garden and cut one. This is not the definition of a "good cut flower." Commercially viable cut flowers must meet much more stringent requirements to be profitably grown.

We have trialed dozens of different varieties of herbaceous perennials that have been touted as "good cuts" and we have rejected them for a variety of reasons. A few examples include:

Doronicum, the market will not pay much for another daisy flower type in early spring. While it looks great in the garden, it has a fleshy stem, doesn't ship particularly well, and must compete against stronger stemmed marguerite daisies and mums from California and foreign producers.

Pardancanda, beautiful orchid like blooms on a stiff irislike stem of good length. Unfortunately, it closes in the dark and doesn't reopen!

Which flowers are really commercially viable and profitable is a vast enough subject to be the focus of many other papers. The Association of Specialty Cut Flowers is a excellent source of information about the suitability of herbaceous perennials for the cut flower market. The address is listed at the end of the paper. I feel it would be especially productive for the Perennial Plant Association and the Association of Specialty Cut Flower Growers to work closer in the future for the greater benefit of their members.

MARKET OPPORTUNITIES

There is a large variety of ways for current producers of herbaceous perennials to market cut flowers. In the ASCFG, I know of a large variety of operations. They include road side stands, u-pick operations, farmers' markets, and retail florist operations growing a portion of their own consumption. Many of these operations can generate significant income.

Our operation was capitalized from its own sales. In the early years of the business, we sold to local wholesale florists, sold to retail florists from a market stall at the Portland Wholesale Flower Market, and retailed excess at several local farmers' markets.

In larger metropolitan areas, growers often run route trucks that deliver directly to retail florists. Here & Now Garden is a grower/shipper operation that ships the majority of its production out of Oregon. We market to wholesale florists, supermarket and other mass merchandisers, and large floral retailers. The cut flowers are shipped airfreight, FED-X, or refrigerated truck on a daily basis. Daily availability is faxed to our customers and orders are taken by phone and confirmed by FAX. Orders are shipped to the customer in as little as a few hours after an order is received. Cut flowers are truly a "just in time" inventory item. Our product changes from gold to garbage in a matter of days.

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POST HARVEST TREATMENT

The most critical element of cut flower production is post harvest treatment. Cutflowers must be cut, bunched, and hydrated with a floral preservative immediately after cutting. The flowers must be moved into refrigeration as soon as possible after harvest. Flowers and foliage must be free of excess moisture before cooling to prevent the growth of fungus and bacteria.

The global shipping of cut flowers is made possible by proper post harvest treatment. When flowers are cooled to 34-38 degrees F, they can be packed in boxes and shipped. The boxing of cut flowers is an art that is best learned at the side of an experienced packer. Flowers are placed in newspaper lined boxes with head space allowed between the flowers and the end of the box. Bunches have perforated sleeves that allow the flowers to respire but protect them from movement. Stems of the bunches are interwoven and secured to the box with a wooden cleat. In this way the bunches of flowers can't shift within the box and become damaged. Freight companies are not known for their gentle touch.

The cold thermal mass of the box of flowers is maintained by adding packages of frozen gel ice and precooling packed boxes by blowing air through specially designed holes in the flower boxes. Flower boxes themselves are sized to meet the freight rates of the airlines. Common sizes are a full box (44 X 20 X I2) and a halfbox (44 X 20 X 6). Two full-boxes are necessary to get the cheapest air freight rate of a dimensional 100 lb. A full box can hold anywhere from 50-75 bunches of flowers containing 10 stems each. Packed boxes are delivered to the airport in refrigerated trucks a few hours before flights chosen for shipment. There are a lot of ways for things to go wrong even when you do everything right. Yet, everyday, flowers are crisscrossing the globe successfully.

DIFFERENCES IN CUT FLOWER PRODUCTION vs. FIELD DIVISION PRODUCTION

Cut flower production is designed to optimize the length and strength of the flower stem. Florists like to have long stems in order to have flexibility in arranging the individual stems. Supermarkets like uniform long stems to match their standardized display requirements.

The growing of the flower is manipulated to achieve a stem length of a minimum of 16", preferable 24-36". Anything shorter is a very hard sell. Plants are often grown in dense plantings to encourage stem elongation. This requires the use of staking and netting to assure that the crowded stems don't fall over and become soiled or bent.

Overhead watering is not possible when the flowers are setting bud. Drip irrigation is required to achieve commercially acceptable stem length, flower quality, and foliage. In addition the control of foliar diseases and cleanliness is enhanced with drip systems. Each flower must be picked at the perfect stage for that particular variety. Each is different. The production field must be laid out so that pickers can quickly transport cut material to the harvest cart efficiently. In practical terms, this means flower production beds are rarely longer than 120 feet. Production fields with rows or beds hundreds of feet long mean bunched flowers staying in the field too long, or bunches laid in the dirt or mud to await transport to the edge of the field. Neither is acceptable in cut flower production.

Flowers must be cut, processed, and shipped immediately to insure that the customer has a vase life of 7 to 10 days. Processing systems must be developed to quickly move the cut material through processing and to the freight carrier. The requirements of this processing are entirely different from the processing of perennial divisions. Even the cooler coils are different. Floral coolers need to be maintained at 38 degrees F, with low air flow condensers to prevent the drying out of foliage and flowers.



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PRODUCTION

The profitable production of cut flowers from perennials is possible without the use of synthetic fertilizers and pesticides. Here & Now Garden is a Demeter certified biodynamic operation exceeding all the requirements required by the Federal and State governments of the United States to be a certified organic farming operation. We compete in the world floral market and receive no price premium for our growing methods.

Serious consideration of sustainable systems for the cultivation of cut flowers is important to commercial success because of increasing environmental regulation and chemical costs. Every year more chemicals are banned from use in agriculture, especially those for minor crops such a specialty cut flowers. Chemical companies lack the economic justification for the registration necessary for the use of chemicals on minor crops. Environmental law is shifting the cleaning up of pollution from agricultural chemicals to the producers and users of these chemicals. More farms in the future will be burdened with the cost of removing agricultural chemicals found in soils, water tables, runoff, or spray drift. In addition, many pesticides become less effective over time as their intended targets develop resistance and immunity to these measures. Decreasing soil fertility and plant vitality are also symptoms of less than adequate cultivation methods.

BIODYNAMIC METHOD

The foundation of Biodynamic production of cut flowers is the growing of a healthy fertile soil. Through the cultivation of biologically rich soils the production of healthy and disease free plants is made possible. The need for toxic controls is dramatically reduced.



The Biodynamic Method concentrates on practices that increase biological diversity in the soil. Soil sterilization and the application of synthetic fungicides and pesticides are incompatible with the Biodynamic Method. Biodynamic approaches the farm as a living organism that needs to be cultivated by the farmer for optimum soil health.

The Biodynamic Method is the oldest sustainable system of agriculture practiced in the western world today. The principles on which it is based were introduced by Rudolf Steiner in Austria during the 1920's. The method was later refined in the United States by Dr. Pfeiffer. In the late 1960's and early 70's Alan Chadwick further developed the method into the Biodynamic French Intensive Method of horticulture. Chadwick established a research facility and demonstration farm and garden at the University of California at Santa Cruz. The Biodynamic French Intensive Method is labor intensive and developed for small acreages and operations functioning without mechanical equipment.

Here & Now Garden has adapted these methods of horticulture to commercial floriculture production. Improved technologies are available today for the application of the Biodynamic Method. Modern agriculture has developed specialized tractors and bed shaping equipment, mechanical mulchers, reusable polypropylene mulch, computerized drip irrigation, and mechanical spraying and injection systems.

SOIL AND COVER CROPS

Production fields should have a soil analysis defining soil structure, humus content, and chemical nutrient levels. The optimum soil is a sandy loam soil that is well-drained and has a high humus content. Specific deficiencies can be corrected through altering the content of the organic plant food mix and additives to the Biodynamic compost.



The current weed population and surrounding field populations should be analyzed for development of a weed control program. Specific cover crops can be chosen to discourage or eliminate weeds. Spring/summer sowings of buckwheat followed by overwintering with annual rye/vetch will eliminate joint-grass and dramatically reduce morning glory (*Convolvulus*). Sudan grass produces incredible quantities of vegetative matter to aid in building soil humus levels. In addition, Sudan grass has an extensive fibrous root system that is very valuable in healing the damaging effects of improper cultivation practices like the digging or sowing of crops in wet soils.

Cover crops are an excellent means of preparing the soil of cut flower production fields. It is possible to get as many as five different rotations of cover crops in a single year. Other excellent cover crops are crimson clover, fava beans, oats, and alfalfa. Cover crops are generally tilled in at peak flower before seed is set in the plants. Crops are generally mowed or flailed and then tilled in. The value of the cover crop is greatly diminished by leaving the mowed vegetative material on top of the field too long.

A year in a cover crop rotation can significantly improve both soil structure and biological activity in the soil. The latter is important and the use of fungicides and pesticides is to be avoided. Substantial quantities of plant material incorporated into the soil by the tilling in of cover crops promote the growth of abundant microorganisms in the soil. These microorganisms are 99.9% beneficial to plants. Many microorganisms are natural predators to the fungus and bacterial diseases of cut flowers. Properly prepared compost applied annually to the field is important in maintaining soil fertility and increasing microbial activity.

It is useful to visualize the amount of plant material produced by the farm that is exported. These bunches of cut flowers leaving the farm require that an equal amount of plant material be returned to the soil if the production system is to be sustainable. The production and application of compost must equal the mass of plant material exported, or the soil is being "mined" of its nutrients for the crops sold. Unless this material is replaced soil will lose fertility, stable humus levels will decline, and cultural problems will increase.

The structure of the soil can be significantly improved by cover crops. The deep penetrating roots of some cover crops can shatter soil hard pans created by cultivation. The decomposed plant material tilled into the soil eventually becomes stable humus that improves the aeration and drainage of the soil thereby enhancing the nutrient absorbing ability of the crops fine root hairs.

Cover crops should be tilled in before allowed completely to dry out. The soil should be sprayed with a soil inoculant to speed the decomposition of the plant material and establish beneficial soil microorganisms. Either the "Pfeiffer Field Spray" or BD Barrel Compost can be used. The time necessary for the soil to break down the vegetative matter can be reduced to as little as two to three



weeks with these field sprays.

FERTILIZATION

Depending upon the requirements dictated from a soil analysis, generally the application of compost, manure, and organic plant fertilizer is necessary for optimum growth. The following table details the rate of application by soil fertility.

GENERAL FERTILIZATION PROGRAM (Tabel 1)

SEE PAGE xx For Table 1

Perennial plants should be top dressed each spring with 1/4 - 1/2" of ripened Biodynamic compost. Biodynamic compost is a specific kind of compost that requires nine months to a year to break down and become fully stable for use. The specific compost most suited to cut flower production is the Pfeiffer recipe that is made from layering materials into a windrow pile 12-15 feet wide, 6 feet tall and as long as is necessary to produce the quantity of compost necessary for production. This compost is comprised of dairy manure, soil, plant trimmings (from the fall clean-up), leaves or some highly carbonaceous plant material such as straw or spoiled hay. The materials are layered onto the pile to assure a carbon/nitrogen ratio of approximately 30 to 1. Soil additives are also incorporated into the compost to become stabilized for more efficient utilization by the plants. These additives are greensand, rock phosphate, oyster shell, and kelp. Approximately 50 lb. of each additive is used per 25 tons of compost. The compost is treated with the six Biodynamic compost preparations to produce a balanced plant food and soil conditioner. The preparations are created through the controlled composting of specific herbs:

> #502-Yarrow #503-Chamomile #504-Stinging Nettle #505-Oak Bark #506-Dandelion #507-Valerian

This finished compost is rich in trace elements and the microflora necessary to produce a healthy soil capable of inhibiting fungus and viral diseases. An excellent description of making this compost is in Dr. E. Pfeiffer's book <u>Practical Guide to the Use of the Biodynamic Preparations</u>.

An organic plant food is banded into the bed under where the cut flower plants will be planted when the bed is being shaped or it is worked into each planting hole for the plants as they are being planted. This balanced plant food is 4 parts seed meal, 1 part rock phosphate, 1/2 part kelp, and 1 part greensand. See the Fertilization Table for an exact formulation to meet specific growing requirements.

TILLAGE

The French Biodynamic Intensive Method of horticulture includes an emphasis on deep cultivation and raised beds. Alan Chadwick observed that plants growing in land slides had increased growth. The tumbling action of a land slide produces an upper soil horizon with increased pore space between soil particles, better soil aeration, and increased root growth in plants. This resulted in increased production and plant vigor.

The French Intensive Method duplicates this environment with the double digging and raising of the plant beds. Raised beds increase plant growth and flower production by increasing the area of the upper soil zone available for root growth. Mechanically produced raised beds can be constructed with tractor mounted bedding equipment. In clay soils the intensive method calls for double digging or deep non-soil horizon mixing tilling of the soil. This can be accomplished mechanically with a articulating spader attachment on a tractor, such as the Celli spade cultivator. Here & Now Garden plants in 10" high, 3' wide raised beds.

PLANT SPACING

Most perennial cut flowers are planted 1.5 plants per lineal foot of bed in a matrix pattern. This gives each plant a 16" diameter root zone. In perennial plantings this spacing produces a bed that is completely covered by the leaf canopy by the end of the second growing season. Most annual cut flowers are planted 2.5 plants per linear foot of bed.

The utilization of matrix planting on raised beds significantly increases the number of plants that can be grown per acre. For example, in peony production, raised beds matrix planted result in 10,000 peony plants per acre compared to about 7,000 plants per acre in row cropped fields.

WEED CONTROL

The use of precision mulching in the cultivation of cut flowers seeks to reduce the area of the field available to weed growth through restriction of light to the soil. Woven polypropylene fabric is used to cover any field area not utilized by the plants.

Bed tops are covered with the most porous material available to allow adequate water and air to the soil. Soil will not turn anaerobic under woven polypropylene as it does under black plastic. The mulch must restrict light to weed seeds but allow the soil to breathe.

When the beds are formed the soil has been worked to a fine tilth and is weed free. These beds are then covered with a highly porous woven polypropylene weed barrier. Plant holes 6" square are burned into the 3' wide weed barrier arranged in the matrix pattern described earlier. The paths of the beds are covered with U.V. inhibited woven polypropylene. This material is commonly used under containers in nurseries and can withstand tractor and foot traffic while allowing some air and water penetration.

The top of the bed is then mulched with a 1-2" layer of horse manure/wood shavings. This mulch is spread with a tractor mounted mulcher capable of mulching four or more acres of raised bed in a single day. The polypropylene weed barrier prevents weeds germination on most of the bed, and the layer of horse bedding mulch smothers weed in the uncovered planting holes. The perennial plants can easily break through this mulch and crowd out any weeds. The bed tops require 3-4 hand weedings annually to remove small wind born weed seeds that attempt to establish in soil of the planting holes in the weed barrier. The amount of weeds that germinate in this area is small and two persons weeding by hand can clean a two-acre field in a day. Weeds are eliminated using this method without herbicides.

The weed barrier remains on the bed for 2-3 seasons until the perennial plants establish themselves and the crowns begin to crowd the planting hole. By the third growing season the plants have established a heavy leaf canopy that will cover the entire bed and out compete most weeds. Depending upon the quality of the weed barrier purchased the useful life can exceed 10 years.

Fields irrigated with a drip irrigation system will water only the planted area of the field and dramatically reduce weed growth in other areas. This can produce a significant reduction in weeding costs.

All tractor paths are sown in a permanent cover of perennial low growing grasses and white clover. These paths are mown and the clippings collected for compost. A two-foot tilled swath is maintained around the sections of the production fields covered with polypropylene mulch. This prevents invasion of weeds by runners into the poly-mulched area.

FIELD HYGIENE

A field free of weeds will have less competition for water and plant nutrients. To avoid problems associated with monocropping, cut flower fields should be interspersed by species. If some crop diversity can be maintained on the farm and weed populations are kept in check, the incidence of virus diseases and pest infestations is dramatically reduced.

At the end of the season all perennial plants are mowed down to the ground and this plant material is removed and composted. The beds are then top dressed with $1/4 - 1/2^{\circ}$ of horse bedding. This fall clean-up and top dressing is important for control of disease. Many future disease problems are eliminated by the removal and composting of potential pathogens. The application of finished compost (and plant food as necessary) increases soil microbial activity which inhibits remaining pathogens. The removal of weeds eliminated competing plants and possible hosts of more pathogens. As long as specific crops are kept in small units on a diversified farm, the field will not be a reservoir for the production of cut flower specific pests.

WATERING

Cut flowers benefit from precise watering. Although many perennial cut flowers can be observed sustaining tremendous amounts of neglect around many old houses, the plants do produce more flowers and grow healthier with proper watering. The ideal watering system is one that allows both overhead and drip irrigation. The drier the foliage during the flowering season, the lower the incidence of fungal diseases and botrytis. Drip systems delivering water only to the roots are ideal. Overhead watering is an efficient way to foliar feed, and apply prophylactic sprays to prevent botrytis and powdery mildew.

FUNGUS AND BOTRYTIS CONTROL

Fungus and viral infections are controlled first by proper soil cultivation and secondly by proper stimulation of plant growth. The extensive effort placed in soil preparation and compost application are to foster the



development of plants that are naturally resistant to infection. The BD Field Spray 500 (composted horn manure) is used in early spring to stimulate healthy root growth. In the early summer BD spray 501 (quartz) is utilized to inhibit fungus and virus disease and stimulate leaf growth and plant vitality. Small quantities of these sprays are required for large areas. Four gallons will treat two acres.

It is unwise to overfeed cut flower plants with nitrogen. The resulting fleshy growth is highly susceptible to fungus and viral infections and more prone to insect predation.

Botrytis is of particular concern for many cut flowers in the Pacific Northwest. Botrytis damage has been prevented by utilization of the Biodynamic method. Two efforts are required: enhancing the plants' resistance to the incubation of the Botrytis spore, and encouraging microbial activity in the soil to draw fungal activity away from plant foliage.

The resistance of plant foliage to fungus and botrytis infection can be increased by foliar feeding every 10 days during cold wet weather in early spring. The leaves of the plants are wetted with a foliar spray of kelp and BD preparation 508 (*Equisetum arvense*). One ounce of chopped dry *Equisetum* is required to make about four gallons of 508 tea which is sufficient for two acres of thick foliage. The 508 is diluted into 50 gallons of the kelp/fish spray and applied at the same time. These sprays can also be injected into overhead irrigation for easy application.

Plants should be scouted daily for botrytis. Infected plant parts are pruned, collected and sent to the landfill. These prunings are not burnt since botrytis can spread on smoke. If botrytis erupts to a problem level despite these preventative measures, a copper sulfate spray can be used as a control method to limit the infestation to an economically acceptable level.

After the crop has died back for the season, all plants are mowed to the ground and the dead plant material is composted in treated compost piles. This field sanitation is an important element in control of fungus diseases.

INSECT PEST CONTROL

Flea beetle (*Epitrix*, various species) and cucumber beetle (*Acalymma uittatum* or *the Diabrotica undecimpunctata*) are the primary insect pests that can do extensive damage to the flower buds during formation. The beetles chew the edges of the flower, or they bore into the bud slightly. Scouting of the field is necessary to determine if the beetle populations are reaching damaging levels. Long periods of warm weather can increase the beetles to levels where the damage affects the crop. One or two applications of Pyrethrum or Rotenone sprays can reduce populations enough to harvest undamaged crops. Timing of these sprays is critical to their effectiveness. The most productive time to spray is early afternoon when beetle activity is highest. These control methods should be used sparingly because populations of beneficial insects are also reduced by these broad spectrum insecticides.

In a well established Biodynamic operation high populations of beneficial insects often develop without artificial introduction. Parasitic enemies of cucumber beetles include a tachina fly, *Celatotia setosa*, a braconid wasp, *Syrrhizus diabroticae*, and a nematode, *Howardula benigna*. The most important predator of cucumber beetles is a soldier beetle, *Chauliognatlius pennsyluanicus*.

Insects, diseases, and weeds are visible symptoms challenging the grower to understand what part of the farm organism is weak or out of balance. Changes in cultural methods, elimination of habitat, introduction of biological controls, or specific application of biologically derived pesticides are all acceptable methods to maintain economic production and continue building a sustainable ecological growing operation.

RESOURCES

BIODYNAMIC AGRICULTURE

General information and publication list:

Biodynamic Farming and Gardening Association P.O. Box 550



Kimberton, PA 19442 (215) 935-7797

Publications available from Biodynamic Association.

Practical Guide to the Use of the Biodynamic Prep arations, E. Pfeiffer

Agriculture. Rudolf Steiner

Biodynamic Greenhouse Management., Heinz Grotzke

<u>Biodynamic Agriculture</u>, Koepf/Pettersson/ Schaumann

BIODYNAMIC PREPARATIONS AND SPRAYS

Biodynamic preparations are commonly made by experienced Biodynamic farmers, or produced cooperatively by local Biodynamic groups. The preparations are available for purchase from:

Josephine Porter Institute, P.O. Box 133, Woolwine, VA 24185

The institute is a non-profit service to encourage the use of Biodynamic preparations. They can accommodate small orders and have a subscription service to supply greater quantities on a scheduled basis for larger operations. Annual cost of preparations for a 10-acre farm

> GENERAL FERTILIZATION PROGRAM (per crop per 100 sq.ft. bed)

Function	Source	1st & 2nd yr. poor soil	3rd & 4th yr. aver. soil	5th yr. 1st yr. good soil	6+ уг. (see notes)
Nitrogen	Seed Meal	10 lb.	6 lb.	3 lb.	0
	Fish Meal or	5 lb.	3 lb.	1-2 lb.	0
	Blood Meal	5 lb.	3 lb.	1-2 lb.	0
Phosphorous	Bone Meal or	4-5 lb.	2 lb.	2 lb.	2 lb.
	Phosphate Rock	10 lb.	5 lb.	2 lb.	0
Potash and Trace mineral	Kelp or	1 lb.	1 lb.	1 lb.	1/4 lb.
	Greensand	10 lb.	5 lb.	3 lb.	1 lb.
Texturizer	Manure	2 cu. ft.	2 cu. ft.	2 cu. ft.	2 cu. ft.
Microbiotic Life, Humus	B.D. compost	1 cu. yd.	8 cu. ft.	8 cu. ft.	8 cu. ft.

Notes:

1 cubic yard equals 27 cubic feet. 1 cubic yard will cover 100 sq.ft. 1" deep, 2 cubic feet will cover 100 sq.ft. 1/4" deep.

is under two hundred dollars.

Other references:

How to Grow More Vegetables, John Jeavons, 1974, Ten Speed Press, P.O. Box 7123, Berkeley, CA 94707. This is an excellent primer on the Biodynamic French Intensive Method.

CUT FLOWER INFORMATION

Association of Specialty Cut Flower Growers, Inc. MPO Box 268, Oberlin, OH 44074 (216) 774-2887

MATERIAL SOURCES

Woven Polypropylene: DeWitt Company Highway 61 South, RR3 Box 338 Sikeston, Missouri 63801 (800)888-9669, (314) 472-0048

