Final Report - Farmer/Grower Grant #FNE 95-87 Organic Weed Management in Commercial Strawberry Production

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1. Project Goals:
Demonstrate viable alternatives to conventional strawberry production that reduce or eliminate the use of commercial herbicides without escalating labor costs or diminishing yields.

2. Farm Information:
Upinngil is a small farm with three main enterprises : organic produce, livestock and small grains; 40 acres is farmed, 22 owned and 18 rented. Crops are integrated between enterprises, 6-10 ac. of hay, 6-10 ac. of small grains, 4-8 ac of produce and the remainder in pasture, woods and wetland; land for produce is rotated with small grains or forage crops, grain is grown for livestock and straw is utilized in produce as mulch.

3. Cooperators:
Everett Hatch, Hatch's Patch, Plain Road, Greenfield, MA 01301, nursery of potted strawberry plants.

Sonia Schloemann, University of Massachusetts Cooperative Extension, Amherst, MA 01002, Coordinator of Farmer Field Days, Project Advisor.

Edwin McGlew, NOFA Mass, Chestnut Street, Hatfield, MA 01036, advisor of organic standards, coordinator of conference presentations.

4. Project Methods:
Two acres of land that had been cover-cropped especially for strawberries was planted as a demonstration project using three distinct planting systems (ribbon rows, spaced rows, potted spaced rows) in the late spring and early summer of 1995. The field was divided into four blocks by cultivar (Earliglow, Cavendish, Allstar and Glooscap). Each cultivar was planted using all three systems. The entire field was managed on 36" row centers and beds were pruned to 14" width. The planting systems varied as to initial planting density (ribbon rows 6"within row, spaced rows 12" within the row, and potted spaced rows 24-30" within the row) and time of planting . All systems utilized a stale seed bed created by propane flaming. Mechanical cultivation, and hand hoeing with hand weeding in problem areas was the only weed control used after planting. Except for a test strip the entire planting was mulched for overwintering and weed suppression. The entire planting was irrigated as necessary with overhead irrigation guns.

Various equipment modifications and improvements were necessary to complete the plantings. The high density planting required the equipping of a Holland 2002 planter for celery and onions with larger furrow openers and gauge wheels to enable the planting of strawberry plants into raised beds. Several tractors of various manufacture were leased or borrowed searching for the unit that would operate at the proper speeds (slow) to facilitate precise transplanting. Potted spaced rows were planted by hand into marked rows with gauged spacing.

In early spring of 1996 the mulch was raked from the beds into the alleys. Prior to blossoming traps for tarnish plant bug and other pests were set. Bloom began in early May the season tended towards cold and wet with several severe frosts that required irrigation to prevent crop damage. Three sprays of Kocide LF were applied to the planting to control leaf spot due to the nature of the season , an application of rock dust was made to one section of the planting as a trial for botrytis control, and one spray of Pyrellin EC was made after bloom for the control of strawberry root worms. Weed control was generally not a problem until after harvest in July, except for a few problem areas the planting was in fine shape.

After harvest as part of renovation the entire field was cultivated and a hand weeding was done. The plant canopy was not mowed. The beds were kept cultivated with mechanical cultivation every 10-14 days and irrigation was used to help initiate regrowth. Another hand weeding was done in mid-August and by September old leaves had died down and been replaced with new vegetative growth. The field was kept cultivated as late in the season as possible and mulched again for overwintering.

5. Findings/Accomplishments/Unexpected Results:
Propane flaming produced a stale seed bed that greatly decreased the amount of hand hoeing and weeding that is usually required

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The delayed planting date decreased labor costs not only by reducing field management time but by consolidating the farm labor force to a shorter season. Workers were hired to start in June rather than in May and planting was done coincident with harvest operations and renovation operations.

High density planting has a significant beneficial effect on strawberry plants. Later planted high density plantings surpassed earlier planted less dense plantings in overall plant health, total plant production/crop canopy, number of fruiting stems per foot of row and in total yield. It is surmised that the shade offered by a dense planting shields against high temperatures and preserves soil moisture generally keeping plant roots cool and relieving general plant stress.

Shortening of the growing season necessitates greater precision at initial planting since the opportunity to repair beds and time for regrowth is non-existent.

The delay of 3-4 weeks between spaced rows system and the high density system led to a 3-5 day delay in maturity within each variety tested. High density system matured later than the earlier planted spaced rows.

High density plantings remained the most weed-free of the systems trialed and required the least amount of hand labor.

High density plantings renovated more precisely than other systems.

6. Specific site information:

The plantings were made on Hartland Silt Loam. This soil is noted for its productivity, ability to maintain fertility and retain moisture. The growing season in 1995 was extremely hot and dry. However dryness is not suspected for the failure of the potted plant system. Irrigation was provided. Other plantings did not suffer from lack of moisture indeed the heat stress of the growing season made the advantages of the high density system apparent. It is most likely that a combination of error and the use of peat pots let to the severe transplant shock suffered by the potted plants.

7. Economic Findings:

The potted plant system failed to make a crop except in one cultivar (Earliglow) where the yield was below average; comparison with the other systems is not possible. However a typical yield for the 2 ac. planting would have been 20,000 lb., a yield of 15,000 lb. was harvested. Adjusting for the .66 ac of potted system where the yields were not measurable, the yield attained by the other systems was at or above normal yields.

Labor costs for initial planting varied little between plantings. Plant costs were: Spaced Rows, 8,000 plants @ $648; High Density, 16,000 plants @ $1296; Potted System, 4,000 plants @ 2170. Labor and management after planting varied significantly: Spaced Rows required 6 hand hoeings, 6 mechanical cultivations and 4 irrigations; High Density required 3 hand hoeings, 3 mechanical cultivations and 2 irrigations; Potted System required 2 hand hoeings, 3 cultivations and 2 irrigations. Labor for blossom picking is an additional cost for the High Density and Spaced Row systems (@ $112per) that is included in the nursery cost of potted plants. For an organic operation where hand hoeing and mechanical cultivation are the only means of weed control the halving of labor and management costs of the High Density vs. the Spaced Row system more than compensates for the increase in plant costs.

8. Generation of New Ideas to Solve Problems, Next Steps:

The project has successfully demonstrated the benefits of high-density plantings for strawberries. It remains to be determined: what is the best range for planting dates, later or earlier than in this trial; what if any are the negative side-effects of high density plantings; are the benefits of this system lost on growers who utilize herbicides for weed control.

The failure of the potted system is attributed to a combination of planting errors--too shallow planting and use of peat pots. It was suggested by growers who attended the Farmer Exchange of UMass Cooperative Extension that plastic pots could have been utilized and the pot removed allowing the transplants to absorb moisture from their surrounding soil. This system could be trialed again with modifications.

9. Continued Use of Investigated Practice:

Three systems were investigated for length of establishment season and management of weed pests. The superiority of the High Density system for reducing labor costs, improving weed control, maintaining yields makes it a practice that we will use as part of our organic farm management. The Spaced Row system performed as expected but its savings/benefits are not as dramatic as that of the High Density system. The Potted System had been used successfully in previous trials and its failure was seen as an aberration however it is a system better suited to smaller growers as the system requires hand transplanting and is not suited to larger plantings.

10. What I Tell Others of the Project:

I tell other growers that participating in this project has been of great benefit to me professionally and personally. This project gave me the opportunity to develop a planting system that I had believed was beyond my technical capabilities and will enable me to increase production. I also learned many new valuable management practices. The exercise of establishing the planting in sequences taught me not to hurry my work, but to take it in stages, thus the pace at which we work is always a pace that myself and crew are sure of handling. We also learned to keep our rows shorter. Prior to this project all rows had been 400' long. For this project we made rows 250' since one box of plants contain 1,000 and at 2 plants per foot the two row planter would make one pass per box. We found the shortened rows much less discouraging to care for compared to our former 400'. Each row now took 15 min. to hoe and workers had the feeling of accomplishing something rather than defeated as we often felt after half an hour of hoeing a long row. Hoeing two rows in the same time gives us better morale and is more efficient since we are hoeing 500' in the time that we used to hoe 400'. Accounting for the costs of the project and analyzing the work of the farm was an education in itself.

Publicity of the project in local papers has given my and the collaborating farm good press that generated new customers. An additional benefit was that the Volunteers in Overseas Cooperative Assistance recruited me to go to the Republic of Armenia to teach Armenian farmers how to grow strawberries. I conducted a project in April of 1996 and have been asked to return April of 1997 to work with more Armenian farmers.

11. Outreach

Outreach in 1995 included: Farm tours to other farmers by **CISA**, Community Involved Sustaining Agriculture; Public education through a farm display/bulletin board during the picking season; September Twilight Meeting sponsored by UMass Cooperative Extension .

Outreach in 1996 included: May Twilight Meeting sponsored by UMass Cooperative Extension; farm educational display and guided tours during picking season; Slide presentation in August at the NOFA Mass Summer Conference at Hampshire College.

Outreach in 1997 included: Slide presentation in January at the NOFA Mass Winter Conference, Barre, MA.

Twilight meetings were meetings of other strawberry growers and UMass Extension specialists. Farmers were able to inspect the machinery used in the project and examine the plantings and discuss the project with one another. Conference presentations were slide and lecture series to farmers/growers who were growing strawberries or prospective strawberry growers.