FNE93-035

February 1995

The Raspberry Farm
LISA Grant
Report on 1994 Trials

The following is an 'in progress' report on trials done at The Raspberry Farm during the 1994 growing seson. The objectives of our trials were to test for alternatives to; processed lime,synthetic fertilizers and chemical herbicides,for use on cultivated raspberries.

At this time we have filed for a 'No Cost Extension' to continue our trials through the 1995 growing season.We feel that over the course of the 1995 growing season we can obtain more specific information to better determine the effectiveness and practicality of our trials for use by small scale commercial growers of raspberries.

The report follows the guidelines put forth in the 'Sustainable Agriculture Research and Education Program Producer Grant Final Report Format'.

1.) THE GOALS OF OUR PROJECT:

The goals of our project were to A.) Test alternatives to synthetic fertilizers and processed lime, and B.) Test alternatives to chemical herbicides.Both tests are for use on commercially cultivated raspberries.

2.) UPDATED FARM INFORMATION:

The Raspberry Farm cultivates small fruit and corn on @ five acres.We harvest strawberries in June,red raspberries in July,blueberries,blackberries, everbearing strawberries and corn in August,and everbearing raspberries and strawberries through September and October.The majority of our business is 'Pick Your Own'.

3.) COOPERATORS AND THEIR ROLES:

a.) Resource Conservation Services,Inc.
RR #4,Box 2056
Plymouth,NH 03264
(603) 536-5280

RCS provided us with woodash from a wood fired electricity generating facility located in Tamworth,NH.

b.) Larry Bean
4 Pow wow Road
East Kingston,NH 03827

Larry provided us with poultry manure.

c.) Shaw's Hill Farm
15 Shaw's Hill road
Kensington,NH 03833

Shaw's Hill farm provided us with straw to be used as mulch.

d.) Bill Lord,Fruit Specialist
Cooperative Extension
University of N.H.
Durham,N.H. 03824

Bill Lord provided input into our project as well as coordinating and facilitating the Twilight meeting we will host in July of 1995.

4.) WHAT WE ACTUALLY DID:

In the spring of 1994 we planted 1,000 everbearing raspberry plants.(Bare root) These plants all went into one block consisting of seven rows @200 feet long by 4 feet wide/800 sq. ft. per row/5,600 sq. ft. total area.We used this area as our test plot.

A.)TEST ALTERNATIVES TO SYNTHETIC FERTILIZERS AND PROCESSED LIME.

Our experiment consisted of incorporating woodash and manure into the soil before planting.Our idea was to test if the woodash would provide the neccesary catalyst to raise the pH,as well as to add potassium, calcium, phosphorous,magnesium and various micro nutrients to the soil.The manure was incorporated to add a source of nitrogen to the soil as well a range of micro nutrients.In addition,both amendments were expected to increase the organic matter content of the soil which in turn would increase the cation exchange capacity of the soil.These improvements,as we will test for in the years ahead,will allow for less annual input of fertilizers,except for a source of nitrogen which will be added in an organic form.

Woodash was added at a rate of @.75 cubic yards per row,(800 sq. feet.) The poultry manure was applied at a rate of @2.5 cubic yards per row.Because of the perennial nature of raspberries we added our soil amendments in what may seem to be high volumes.The reason being that this was our last opportunity to incorporate soil amendments directly to the root zone.Both the woodash and the manure were incorporated to a depth of 12-18 inches.No other fertilizers of any kind were applied during the growing season.

B.)TEST ALTERNATIVES TO CHEMICAL HERBICIDES.
Our experiment here included two techniques;
1.) Handweeding.
2.) Using mulches; a.) Straw. b.) Compost.

The plants in the test plots were planted by mid April and the need for some sort of management of weeds began in mid May.For the first two months handweeding was done.It was a crucial time for the young plants getting started,so I considered it of paramount importance to keep the beds free of competing weeds.

In early July,once it was evident the plants were going to make it,we began our trials with mulch for weed management.Test strips for both straw,and compost were trialed in each of the rows.Test strips were thirty feet long.The straw was from the 1995 season,and the compost consisted of a combination of poultry manure,leaves and woodash.

The straw was applied @ six inches thick.The compost was applied @ four inches thick.

Handweeding was contiued on as needed basis to keep the weeds properly managed.

5.) FINDINGS AND ACCOMPLISHMENTS.

A.)ALTERNATIVES TO SYNTHETIC FERTILIZERS AND PROCESSED LIME.

During the 1994 season the plants showed excellent growth and some of the plants actually produced a remarkable crop for their first year.Based on soil samples done in 1992,1993,and 1994 it is clear that the soil amendments did have a dramatic effect on the soil status.The organic matter content of the soil increased from 6.5% in 1993 to 9.5% in 1994.This increase had a great effect on the cation exchange capacity (CEC) of the soil,raising it from 12.9 meq/100g in 1993 to 27.9 meq/100g in 1994.The soil tests also show increases in the levels of potassium,calcium, and magnesium,as well as in the base saturation level.These are all positive changes to the soil status.

The only negative finding from the experiment was the excessive increase in the pH. A pH of 8.0 is above the range I would like to see.I hope the pH will naturally drop over the upcoming season so that I will not have to add anything to the soil to drop the pH.A soil test for pH will be done in the spring of 1995.

With the CEC greatly increased,the soil will have a greater capacity to hold nutrients that are applied to the soil in the 1995 growing season.All that I will be adding is a source of nitrogen for the 1995 growing season.This will be in the form of manure and fish emulsion.

If the pH does not wind up becoming problematic,I consider our experiment to be succesful up to this point.In August of 1995,leaf analysis,as well as soil samples,will be done to determine soil management practices for the coming season.

B.) ALTERNATIVES TO CHEMICAL HERBICIDES.

This experiment did not prove as succesful.Handweeding,though effective, required an incredible amount of hours to keep the weeds in check.I would estimate it would require @ 1 hour per week per row to stay ahead of the weeds.Over the course of a growing season that would add up to @ 20 hours per row or 140 hours for the seven row block. At six dollars an hour that comes to @$840.00 for the season to manage weeds in the seven row block.

The mulches did have an effect on the weeds,but only short term.I could discern no difference in effectiveness between the straw and the compost.Both mulches kept the weeds in check for several weeks after they were applied,but once green plant tissue of the weeds poked through the mulch,they grew with the same vigor as those without the mulch.The expense to purchase,and time to apply the mulch,offset any benefit gained from not having to handweed for the several weeks that the mulches were effective.

I think a problem area was that we were introducing weed seeds with the straw as well as with the compost.The compost,in any future trials,would have to be monitored closly to be assured that temperatures are high enough during the composting process to destroy weeds seeds.As for the straw,there will always be weed seeds in any bale of straw,no matter how clean the producing field may be.

In our proposal we had mentioned 'wood chips' as a possible material to trial.After further review we determined that the wood chips would not be a good consideration for raspberries.The concern was that the density of the wood chips would have a negative effect on primocane emergence. We were also concerned that the wood chips would draw nitrogen from the soil to assist in it's own decomposition process.

6.) SPECIFIC SITE RELEVANCE.

Not applicable.

7.) ECONOMIC FINDINGS.

*Incomplete at this time.

Cost comparisms for:

-) Woodash vs. Processed lime as pH adjuster.

-) Cost to purchase manure/woodash and labor to incorporate,and cost of annual application of organic matter vs. annual cost of purchasing and applying various forms of synthetic fertilizers.

-) Cost for handweeding,labor to apply and purchase price of mulch materials vs. cost to purchase and apply herbicides.

8.) NEW IDEAS/NEXT STEP.

A.) ALTERNATIVES TO SYNTHETIC FERTILIZERS AND PROCESSED LIME

The next step in the tests for alternatives to synthetic fertilizers and processed lime wil be to test the soil in the spring of 1995 for the pH level.Hopefully the pH will not continue to climb.As for fertilization in 1995 on the 1994 trial block,we will fertilize only with a top dressing of manure applied in early to mid April,followed with soil applications and/or foliar applications of fish emulsion and kelp extracts.Will we be able to meet the nutrient needs of our plants through this method? I think so.With the soil's CEC increased,the soil will have a greater ability to hold nutrients that are applied to the soil,so we should be succesful using natural fertilizers that contain less concentrated quantities of nitrogen.Leaf analysis and crop yield in 1995 should help us answer this question.

We will be planting 500 red raspberry plants and 500 blackberry plants in the spring of 1995.I will undertake the same pre-plant process as in the trials of 1994.The only change I will make will be to reduce the amount of woodash applied from @.75 cubic yards per row to a more calculated amount based on current pH,desired pH,soil texture of the block to be planted,and CCE status of the woodash.This change would be made to determine if lesser quantities of woodash could be used to raise the pH to the desired level,without overshooting the mark,while still providing a significant addition of potassium and calcium.

I would like to try trials with the same two amendments being added to existing rows of raspberries.The difference here would be that we would be unable to incorporate the amendments into the soil,and would have to apply them as a top dressing.It would be interesting to see what effect on the soil status top dressing these amendments would have. Would we be able to meet the nutrient needs of our plants just by topdressing these amendments,without first having incorporated organic matter into the root zone? Would we have to add any additional synthetic fertilizer? Would we have to apply the top dressing at several different points during the growing season? Answers could be obtained via a 1995 leaf analysis and soil samples from trial and control plots.Could this process of top dressing with a layer of manure/woodash have any impact on weeds in existing rows where weed management has consisted of annual applications of a pre-emergent herbicide as well as spot treatment with Round-up? (In contrast to our 1994 mulch trials for weed management where the bed was newly planted and less 'weed stable'.)

B.) ALTERNATIVES TO CHEMICAL HERBICIDES

The next step to test for alternatives to chemical herbicides? Good question.First off,the 1994 trial was undertaken on a newly planted block, which, because of the under developed root systems of the new plants, had a tolerance threshold for weed pressure that was much lower than would be in an established planting.Another factor that contributed to increased weed pressure in the new block of everbearing raspberries,is that in everbearing culture only the primocane is utilized so there is less canopy than there is in an established planting of summer bearing raspberries which utilizes both primocane and floricane,creating a much denser canopy of foliage to prevent light from reaching the floor of the row to assist developing weeds in their growth.

In 1995 I would like to try these same trials of straw and compost in an established planting of summer bearing raspberries and in an established planting of everbearing raspberries.With a higher tolerance for weed pressure in these established plantings,the meticulous handweeding required on the new plants in 1994 could be avoided.Therefore the mulch could be applied earlier in the season.Trials could be done with the mulch being applied at two different times; 1.) Before primocane emergence. 2.) After emergence when the primocanes are high enough not to be smothered by the mulch. This way the mulch would be in place when the canopy of the row is fully expanded.

9.) CONTINUED USE OF TRIAL PRACTICES?

A.) ALTERNATIVES TO SYNTHETIC FERTILIZERS AND PROCESSED LIME

As stated in number 8,we will utilize woodash and manure as a pre-plant soil amendment in our plantings for 1995. We will also be working with topdressing manure/woodash on existing rows of summer and everbearing raspberries. *Note: Everbearing raspberries,which are pruned to the ground in the spring,are much easier to work with when applying organic amendments than are summer bearing raspberries which have erect canes at all times of the year.

B.) ALTERNATIVES TO CHEMICAL HERBICIDES.

I think we will try a couple of options,as stated in number 8,on a smaller scale than the 1994 trials.The big glitch with weed control trials is that in contrast to chemical control,the more 'sustainable' practices require significantly greater amounts of time and materials to put into place and maintain.

10,11) WHAT DO WE TELL OTHER PRODUCERS/OUTREACH?

As I mentioned in my cover letter we were unable to get on the schedule for the 1994 Twilight meetings.This is to be our main venue to disperse information about our trials to other growers and members of the community.We are scheduled to host a Twilight meeting on July 17,1995 at which time we will orally present our findings to those in attendance,and open up discussion on the subject.

UNIVERSITY OF NEW HAMPSHIRE
Analytical Services Lab, Nesmith Hall
Durham, New Hampshire 03824
Telephone 603-862-3210

SOIL TEST REPORT

Client: Mark Towle
30 Clarks Lane

South Berwick, ME 03908

Lab Number: 3906
Form: Fruit Crops
Sample ID: Lower East 6
Routing: Computer

Received: June 5 1992
Reported: June 5 1992

Recommendations by Computer
Copies to:

Mail to:
Mark Towle
30 Clarks Lane

South Berwick, ME 03908

Recommendations contact:
Bill Lord
Nesmith Hall
University of New Hampshire
Durham, NH 03824
603-862-3200

Laboratory Test Results

			Very Low	Low	Medium	High	Very High
pH	4.9						
SMP Buffer pH	6.2						
Texture	Loam						
Magnesium (Morgans)	81 ppm	162 lbs Mg/acre					
Calcium (Morgans)	588 ppm	1176 lbs Ca/acre					
Potassium (Morgans)	79 ppm	190 lbs K2O/acre					
Phosphorus (Morgans)	4 ppm	20 lbs P2O5/acr					
Cation Exchange	12.8 meq/100g						
Base saturation	29.8 %						
Calcium saturation	22.9 %						
Magnesium saturation	5.3 %						
Potassium saturation	1.6 %						

Lime and Fertilizer Recommendations

Raspberries ----------

Apply 4 tons per acre of calcitic limestone to raise the pH to the desired level of 6.5. — 1992 ✓

For pre-plant fertilizer, apply 400 lbs of 10-20-20 fertilizer per acre.

(Dairy and well-rotted horse and poultry manures may be used pre-plant to supply essential plant nutrients as well as improve soil tilth. Adjust fertilizer rates according to the amount and type of manure used.)

After new growth starts, apply 0.5 to 1 ounce of ammonium nitrate per plant. In succeeding years apply 45 lbs of N per acre (3 lbs of ammonium nitrate or 6 lbs of 15-15-15 per 100 feet of row) before growth starts in the spring. Use the complete fertilizer (i.e. 15-15-15) when phosphorus level is less than 7 ppm and the potassium level is less than 200 ppm. Band applications down the plant rows.

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Analytical Services Lab, Nesmith Hall
Durham, New Hampshire 03824
Telephone 603-862-3210

SOIL TEST REPORT

Client: The Raspberry Farm
PO Box 700

Hampton Falls, NH 03844

Lab Number: 1013
Form: Fruit Crops

Sample ID: Latham

Routing: Specialist

Received: September 15, 1993
Reported: September 17, 1993

Copies to:

Mail to:
The Raspberry Farm
PO Box 700

Hampton Falls, NH 03844

Recommendations contact:
Bill Lord
Nesmith Hall
University of New Hampshire
Durham, NH 03824
603-862-3200

Laboratory Test Results

			Low	Optimum*	High	Very High
pH	6.2					
SMP Buffer pH	6.9					
Texture	Loam					
Magnesium (Mehlich 3	76 ppm	152 lbs Mg/acre	O			
Calcium (Mehlich 3)	2010 ppm	4020 lbs Ca/acre	VH			
Potassium (Mehlich 3	74 ppm	178 lbs K2O/acre	L			
Phosphorus (Mehlich	137 ppm	631 lbs P2O5/acre	VH			
Org. Matter (LOI-360	6.5 %					
Cation Exchange	12.9 meq/100g					
Base saturation	84.5 %					
Calcium saturation	78.1 %					
Magnesium saturation	4.9 %					
Potassium saturation	1.5 %					

* The Optimum range for pH and nutrients may differ from crop to crop. The ranges shown are generally applicable to agronomic crops and home garden crops. These ranges are intended for general reference and may not be applicable to specific crops (especially floriculture and horticulture crops.) Soil micro-nutrient values (if reported) must be interpreted carefully for the crop of interest. Plant tissue tests are recommended to confirm any suspected deficiencies or excesses.

- 2.5 lb Ammonium nitrate/100 ft of row; 1.5 lb April 15; 1.0 lb May 15-20
- 2.5 lb muriate of potash (0-0-60) per 100 ft of row early spring
  = 1.5 # actual K
  = 3.0 # actual K per row

5# 200' rows

Wood ash = 0.6% K = 50# per 200' row = 3# ACTUAL K

UNIVERSITY OF NEW HAMPSHIRE
Analytical Services Lab, Nesmith Hall
Durham, New Hampshire 03824
Telephone 603-862-3210

SOIL TEST REPORT

2823

Client copy

Client:

The Raspberry Farm
PO Box 700

Hampton Falls, NH 03844

Received November 15, 1994
Reported November 17, 1994
Form: 21
Report program: Form21
Report route: Direct

Copies to:

Rockingham County Extension
Nada Haddad
113 North Road

Brentwood, NH 03833
603-679-5616

Test Results for Fall Rasp/Compost (Lab number 2823)

			Low	Optimum	High	Very High
pH		8.0				
SMP Buffer pH		7.4				
Texture		Loam				
Magnesium (Mehlich 3)	>	440 ppm	VH			
Calcium (Mehlich 3)	>	4400 ppm	VH			
Potassium (Mehlich 3)	>	880 ppm	VH			
Phosphorus (Mehlich 3)	>	176 ppm	VH			
Org. Matter (LOI-360)		9.5 %				
Cation Exchange		27.9 meq/100g				
Base saturation		100.0 %				
Calcium saturation		78.8 %				
Magnesium saturation		13.1 %				
Potassium saturation		8.1 %				

Lime and Fertilizer Recommendations

Raspberries ----------

The pH level of 8 is higher than desired. Apply wettable sulfur at the rate of 0 lbs per 1000 SF to lower the pH to the desired level of 6.5. Aluminum sulfate may be substituted for sulfur at 6.94 times the above rate for sulfur or iron sulfate may be substituted at 8.96 times the above rate for sulfur.

Pre-plant fertility levels are adequate for this crop and no additional pre-plant fertilizer application is recommended.

(Dairy and well-rotted horse and poultry manures may be used pre-plant to supply essential plant nutrients as well as improve soil tilth. Adjust fertilizer rates according to the amount and type of manure used.)

After new growth starts, apply 0.5 to 1 ounce of ammonium nitrate per plant. In succeeding years apply 45 lbs of N per acre (3 lbs of ammonium nitrate or 6 lbs of 15-15-15 per 100 feet of row) before growth starts in the spring. Use the complete fertilizer (i.e. 15-15-15) when phosphorus level is less than 50 ppm and the potassium level is less than 200 ppm. Band applications down the plant rows.

For questions regarding the above results or recommendations contact:

MAINE ENVIRONMENTAL LABORATORY
198 Main Street, Yarmouth, Maine 04096

TEL. 207-846-6569
TEL. 207-846-4673
FAX 207-846-9066

Resource Conservation Services
Plymouth, NH
M. Riehs

Sampling Technician: John Balet
Sampling Date : 08/31/93
Sample Matrix : Wood Ash
Date Received : 09/09/93

Sample : A-Monthly Wood Ash Comp.
Report : 09/24/93
Project: Pinetree Power Tamworth
Lab ID : RCS85993-01

Data reported on a dry weight basis.

Parameter	Data	Units	MDL	Analyzed	Methodology	
Arsenic, total	2.2	mg/kg	0.02	09/23/93	3050/7061	SW8
Boron, soluble	42	mg/kg	1	09/23/93	212.3	EPA
Cadmium, total	11.0	mg/kg	0.2	09/16/93	3050/7130	SW8
Calcium, total	192500	mg/kg	100	09/21/93	3050/7140	SW8
Chloride, soluble	2000	mg/kg	250	09/14/93	9252	SW8
Chromium, total	12	mg/kg	1	09/16/93	3050/7190	SW8
Copper, total	112	mg/kg	1	09/20/93	3050/7210	SW8
Lead, total	67	mg/kg	2	09/17/93	3050/7420	SW8
Magnesium, total	15300	mg/kg	100	09/21/93	3050/7450	SW8
Mercury, total	0.03	mg/kg	0.01	09/22/93	7471	SW8
Molybdenum, total	3.2	mg/kg	0.1	09/23/93	3050/7481	SW8
Nickel, total	16	mg/kg	1	09/20/93	3050/7520	SW8
Phosphorus, total	11800	mg/kg	100	09/20/93	4500P	STM
Available Phosphorus	5800	mg/kg	100	09/20/93	2.044/6B	AOA
Potassium, total	121100	mg/kg	100	09/17/93	3050/7610	SW8
Available Potassium	94200	mg/kg	200	09/23/93	2.044EPA	AOA
Sodium, total	8100	mg/kg	100	09/17/93	3050/7770	SW8
Vanadium, total	<10	mg/kg	10	09/17/93	3050/7910	SW8
Zinc, total	1050	mg/kg	10	09/21/93	3050/7950	SW8
CaCO3 Equivalence	54.37	%	0.01	09/23/93	2340B	STM
pH	12.41	units	0.01	09/13/93	9045	SW8
Total Solids	74.29	%	0.01	09/16/93	160.3	EPA
L.O.I. (OM)	14.55	%	0.01	09/15/93	160.4	EPA