

Kennebec
Potatoes
and
Flea
Beetles

ABSTRACT

1. Farmer/Grower Mini Grant, NorthEast Region Sustainable Agriculture Research and Education Program, University of Vermont and State Agricultural college, division of agriculture and Life Sciences, 105C Morrill Hal, Univ. of Vermont, Burlington, VT 05405, Vermon Tuxbury, Assistant Dean.
2. Project Title: Evaluation of Five Organic Techniques on Controlling Flea beetles on Kennebec Potatoes
3. Project Leader: Myra Bonhage-Hale
La Paix Farm
Alum Bridge, WV 26321 (304) 269-7681
3. Funding: \$755.

The objective of this research was to compare the effectiveness of five organic techniques (Reemay cloth, Hot Pepper Spray, Lime Dusting, Centrum Vitamins and Vitamin E) in controlling flea beetles on potato plants. Six new raised beds were prepared on new ground at La Paix Farm. Each bed was prepared and cultivated alike. Eight pounds of Kennebec potatoes (Maine certified) were planted in each thirteen foot bed at the same time. Each bed was treated with one of five techniques weekly after the first flea beetles were seen on May 31. A video tape was taken monthly to document the progress of the potatoes. Results were measured weekly by a flea beetle count and on August 31st when the potatoes were dug and weighed. A Field Day was sponsored by the Lewis County Extension Office and results will be published in their newsletter.

Flea beetles never inundated any of the potato beds. The heaviest count of flea beetles on plants was on the Control bed which yielded the highest number of pounds of potatoes (32 lbs.). The Vitamin E bed had the next heaviest count of flea beetles (about 1/2 of the control bed #) and yielded the third highest number of pounds of potatoes (25.5 lbs.) and the largest potatoes overall. The lowest count of flea beetles were on the Reemay covered bed and the Lime bed which yielded, respectively, the fewest and the third fewest pounds of potatoes. In fact, the Reemay bed had less than half the potato poundage yield of the Control bed (only 15.5 lbs. compared to 32 lbs.) although the Reemay bed potato plants looked better longer than any others.

Therefore, it could be theorized that in a minor influx of flea beetles on potato plants, there is no reason to use any control. So often, farmers get out the spray at the first sign of a bug. This research would challenge the need for a knee jerk reaction to a flea beetle.

The Control bed, , with the highest organic matter content (4.6) had the highest yield of potatoes and the lowest organic matter content bed, the Centrum Bed (2.9) had the second lowest yield.

The Hot Pepper Spray technique was the best control when comparing criteria of cost (3.5 cents a lb.), quality and quantity of potatoes:

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Organically Grown Herbs,
Sophisticated Produce & Related Crafts
Workshops, Tours

Myra Bonhage - Hale
Alum Bridge, West Virginia 26321
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GRANT APPLICATION - Farmer/Grower Mini Grants
NorthEast Region Sustainable Agriculture
Research and Education Program

PROJECT TITLE: Evaluation of Five Organic Techniques on Controlling Flea beetles on
Kennebec Potatoes

Project Leader: Myra Bonhage-Hale
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HC 64, Box 17

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Best Time to call: 9 a.m. to 10 a.m.

Funding Request: \$755.

1. Objective (What do you want to do?):

Compare the effectiveness of five organic techniques (Reemay cloth, Hot Pepper Spray, Lime dusting, Centrum Vitamins and Vitamin E. Solution) in controlling flea beetles on potato plants.

2. Background Information

Non-organic farmers now usually use Sevin to control flea beetles. This pesticide has been found to be detrimental to the environment and to people's health. Therefore, raising consciousness of alternative, non-toxic control of flea beetles may benefit the farmer, the earth and the consumer.

3. Project Description (Describe what you intend to do):

1. Five new raised beds will be prepared on new ground at La Paix Farm. Each bed will be formed in the same way and will be contiguous to each other. Soil samples will be taken of each bed as a control.

2. Ten pounds of Kennebec potatoes bought from the same source will be planted in each bed at the same time.

3. Each bed will be treated with one of the five alternatives (Reemay cloth, Hot Pepper spray, Lime dusting, Centrum Vitamins and Vitamin E. Solution).

4. Records of formulas used, application frequency will be kept.

5. Each month (April through September) a still picture and video of each bed will be taken.

4. How will you measure results?

1) Flea beetle damage on leaves - examined weekly, photographed monthly.

2) Measure pounds of potatoes harvested from each bed.

continued

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5. Outreach plan (How will you share the information with other farmers/growers?):
- 1) Field Day - sponsored by Lewis County Extension service. Still pictures, videos and beds will be shown.
 - 2) The Extension Service will publish a summary of the experiment and the results in their newsletter.
 - 3) La Paix Farm has monthly or more workshops/tours in which the beds can be shown and discussed. See brochure enclosed for schedule of workshops.

6. Collaborators:

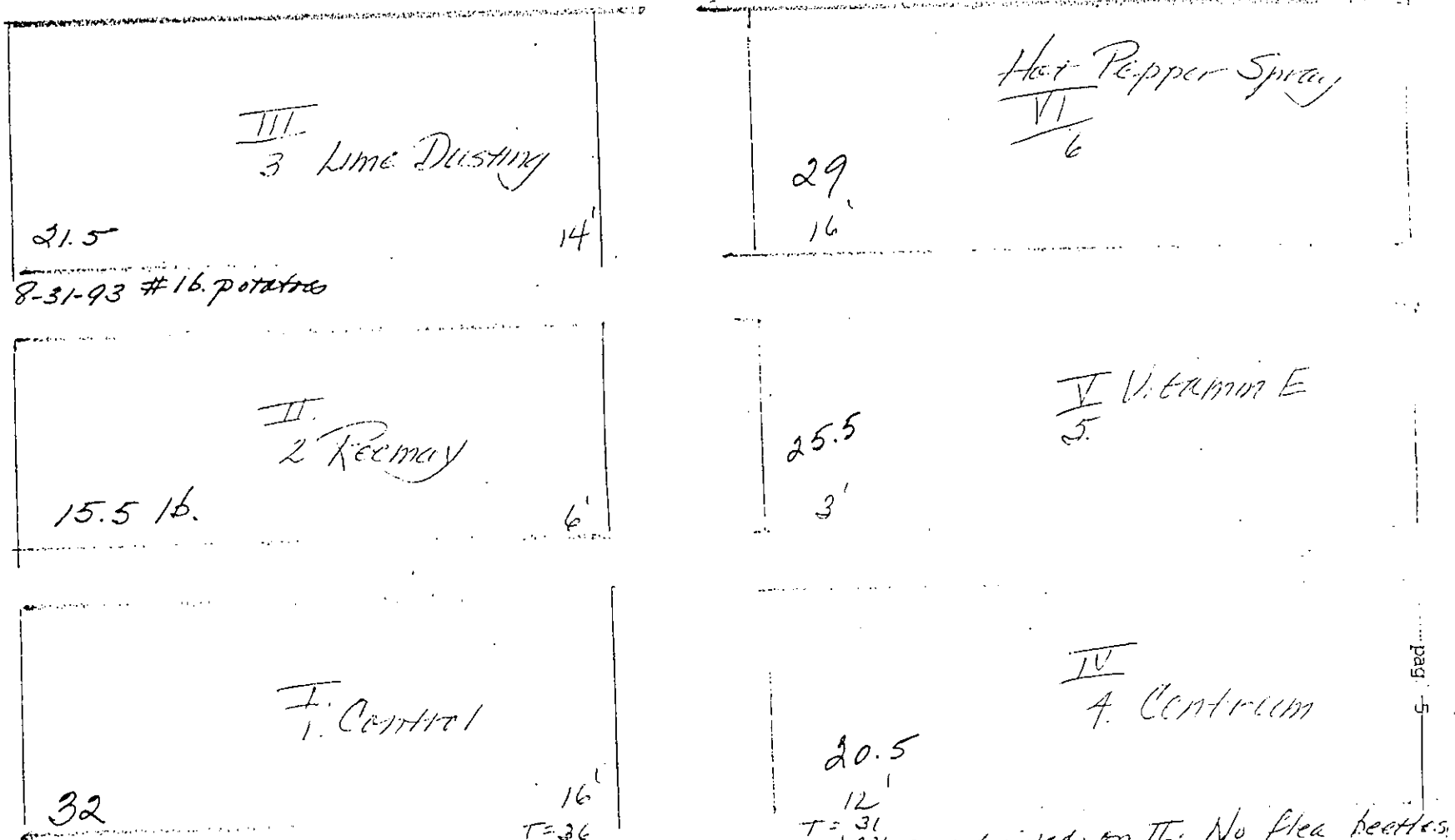
Name	Role
1. La Paix Farm	Land, records, publicity, supervision
2. Lewis County Extension	Field Day, newsletter

7. Additional information about the project (Optional).

Because La Paix is host to many groups throughout the growing months, this is a unique opportunity for observation by many visitors and guests.

Records of cost of each technique will also be calculated, as well as comparison of the cost (monetary) of using Sevin on a similar area.

Sustainable Agriculture Grant 1993 - SARE



5-13: After good rain, counted # potatoes up - Keemay adjusted on II. No flea beetles.

ACTIVITY BY DATE:

1. 4-16 and 4-20-93: Clearing and building six raised beds (soil samples taken) 1/3 wheelbarrow of compost each thirteen foot bed; 1/6 of 4 lb. Dragon Bone Meal, 1/6 of 3 lb., 8 oz. Dried Blood (Dragon).
2. 4-19-93: Bought 10 metal stakes, clips, bone meal and blood meal, 50 lb. Kennebec potatoes (Maine certified) in Weston.
3. 4-21-93: TC to Lewis County Extension re: question of VIT E application, message left.
4. 4-21-93: TC Bonnie L. (VT.) re: budget expenses for labor.
5. 4-22-93: TC Larry Bennett WVU Soil Test Lab (293-6258) re sending soil samples. OK to send together in separate packets.
TC John Jett WVU re: application VIT E, message left.
TC Lewis Co. Ext. re VIT E applic., message left.
6. 4-23-93: TC Lewis Co. Ext. re VIT E. applic. - not in.
TC Bob Young Agric. Spec. WVU Plant Pathology (293-4480 WVU greenhouse) He suggested putting VIT E. oil on each potato eye before planting and a solution of 10 tablets (400 I.U.) in water for each application.
He also suggested putting two crushed Centrum tablets in light soil above each planted potato and a spray of 4 crushed tablets in water for each application.
This advice was followed.
7. 4-23-93: I planted all six beds with potatoes:
 - a) 8 lb. each bed, 17+- potatoes each bed, about 6-8 inches between each potato. All potatoes were small whole potatoes except for one potato which was cut in each bed.
 - b) VIT E bed - each main potato eye had 1 VIT E gel spread on it; little on other eyes.
 - c) CENTRUM: Two tablets each potato crushed on top of soil sprinkled over each potato.NOTE: This was a ROOT DAY on Kimberton Hills calendar.
8. 5-4-93: TC Bruce Lloyd to plan Potato Field Day. 1/2 hour.
9. 5-7-93: First potatoes up. Reemay cloth applied to Reemay row.
10. DAYS OF OBSERVATIONS: 5-13-93, 5-17-93, 5-24, 5-31, 6-7, 6-14, 6-21, 6-25 (FIELD DAY), 7-2, 7-9, 7-16, 7-24, 7-30, 8-7, 8-16.
See individual notations for #. flea beetles seen, notes.
11. Days of applications of techniques began 5-31 when first flea beetles were seen and were conducted on each observation date thereafter.

- 6-15-93: (also 5-15-93), 7-16, 8-16 and 8-31-93) Videotaped potato beds. See Video Tape for details.
- 6-15-93: Steve hilled 6 potato beds after tilling around them. Hay on potatoes and on area, weed ate arund electric fence. Hilling material included 1 wheelbarrow full of mixed compost and dirt from another garden on each of the six beds.
- 6-16-93: TC to YT re: \$
TC Extension Lewis County re: newsletter copy (see Appendix)
- 6-22-93: Weed ate arund electric fence, adjusted Reemay, cleared path for Extension guests.
- 6-23-93: Zeroxed orgnized material for handouts at Field Day.
- 6-24-93: Fertilized (Kelp) each bed, straightened garden, cleaned bathrooms for Field Day.
- 6-25-93: POTATO FIELD DAY. See Video tape.
- 7-8-93: Paper Work, Grant.
- 7-16-93: Paper Work, Grant.
- 7-30-93: Watered beds 5 hours (see precipitation notes. for further water information).
- 8-21-93: TC Bruce Lloyd re possible participation in digging potatoes. Unalbe to reach as in workshop all week. Makde arrangements with neighbors to dig up potatoes on 8-31-93.
- 8-30-93: TC Bruce Lloyd, Lewis Co. Extension to see potato digging.
- 8-31-93: Dug up potatoes, I supervised, videotaped and photographed. (Due to delay in photo development, these may be sent later)
- 9-1-93: Duplicated two video tapes of Potato Grant from mini cam tape.
- 9-2-93: Organized report. Gathered material data, TC WDTV to ascertain rain gauge data (none available).
Began charts.
- 9-3-93: Began to type up report. On 8-31-93 I also phoned Bruce Lloyd of Lewis Co. Ext. and Keith Dix of Sustainable Agric. Dept., WVU and gave preliminary results of digging. Both want Abstracts of report for Extension newsletter and Organic Harvester, the newsletter of the Mountain State Organic Growing and Buying Association. Both told video was available.
- 9-2-93: Received slides of project back - used wrong film for slides. Will have to send photos.
- 9-4-93: Writing, typing up report.
- 9-6-93: Writing, typing, making cover for report.
- 9-7-93: Zeroxing 5 copies of entire report, 10 copies of mini-report.
Mailed report to U. of VT.

Potato Bed Name and Number	pH	LBS/ACRE				% O.M.	% SAT.				CEC FS	# Potato Plants Up		# Flea Beetles				# LB Potatoes each bed	Cost of Materials	Cost per pound	
		P	K	CA	Mg		K	CA	Mg	H		5-13	5-17	May	June	July to Aug	July T				
1. Control	5.1	116	554	2150	298	4.6	6	45	10	40	61	16	20	3	10	80	3	96	32	0	0
2. Reemay	4.9	73	506	1890	226	4.2	5	38	8	49	51	6	18	4	1	20	1	26	15.5	\$ 5.	.31 ^P
3. Lime	5.1	79	392	2080	224	3.3	4	44	7	47	52	14	17	2	1	21	2	26	21.5	.50	.02 ^P
4. Centrum	6.3	82	460	1910	260	2.9	7	58	13	22	78	12	19	4	6	37	0	47	20.5	\$ 11.09	.55 ^P
5. Vit. E	5.0	67	425	1940	252	3.2	5	43	9	43	57	3	14	4	10	35	0	49	25.5	\$ 8.70	.34 ^P
6. HOT PEPPER	5.1	42	331	1740	225	2.9	3	34	7	56	44	16	21	2	16	22	0	40	29	1.00	.035 ^P

COMPARISON

CHART

Cost of Sevin: applied 10 times \$2.17^a
 However, environmental and health costs
 of using are difficult to assess. ^b This would
 be 10¢ a pound if average yield was 24 lb.
 for pesticides only

- * may be reused at least once which is reflected ^{in cost}
1. 1/2 bottles Centrum \$7.39 @ \$11.09
 2. 120 Vit E at 6.19¢ @ \$8.70
 3. 1 red pepper (last year crop) 10¢ @ \$1.00
 4. First bottles not seen until 5-31-93. ^{Final}

NORTHEAST REGION SUSTAINABLE AGRICULTURE RESEARCH AND EDUCATION PROGRAM

Evaluation of Five Organic Techniques on Controlling Flea Beetles on
Kennebec Potatoes

La Paix Farm, Alum Bridge, WV 26321

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CONCLUSIONS

Flea Beetle Control

Flea beetles never inundated the potato beds. The heaviest count of flea beetles on plants was on the Control Bed which yielded the highest number of pounds of potatoes (32 pounds). The Vitamin E Bed had the next heaviest count of flea beetles (about half the Control #) and yielded the third highest number of pounds of potatoes (25.5 lbs.) The lowest count of flea beetles were on the Reemay Bed and the Lime Bed which yielded fewer potatoes than all the other beds and three other beds, respectively (15.5 lbs. and 21.5 lbs.) In fact, the Reemay covered Bed had less than one half the potato poundage yield of the Control Bed (only 15.5 lbs compared to 32 lbs.) Strangely enough, the Reemay Bed looked better than all other beds throughout much of the growing period. See video. Because of these results, it could be theorized that in a minor influx of flea beetles on potato plants, there is no reason to use any control measures. So often, farmers get out the spray at the first sign of a bug. This research would challenge the need for a knee jerk reaction to a flea beetle sighting.

The Soil

As the potato beds were all in the same soil and treated the same way (see Activity notes), I am puzzled as to the variance in pH, organic matter and saturation (see Comparison Chart for details). A wide pH result (from 4.9 in the Reemay bed to 6.3 in the Centrum Bed) does not seem particularly important as the lower pH necessary for potato growing did not positively effect the Reemay bed. Perhaps the heat engendered by the Reemay during a very hot summer with at least two week long heat waves (see chart) mitigated any soil difference benefits. Keith Dix Visiting Professor of Sustainable Agriculture at WVU Extension states that Reemay can up the interior temperature of a bed up to 20 degrees in a heat wave.

However, if the organic matter soil analysis is correct (there is a possibility that the sample was skewed inadvertently) the control bed, with the highest organic matter content (4.6) had the highest yield of potatoes and the lowest organic matter content bed, the centrum bed had the second lowest yield of potatoes (20.5). the reemay bed, with the second highest organic matter content (4.2) and the lowest yield (15.5), again breaks any pattern, perhaps because of other factors.

Evaluation of Five Organic Techniques on Controlling Flea Beetles on
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CONCLUSIONS (PAGE TWO)

Quality

Although the Vitamin E bed had only the third highest yield of potatoes, these potatoes were the largest and the most similar in size. The Control and the Hot Pepper beds were second and third respectively in this criteria. The Reemay Bed had the highest number of tiny potatoes and very few large potatoes. See Video and photos for details.

Efficacy of Techniques

The Reemay and Lime techniques controlled flea beetles better than the others, but for cost (3.5 cents a lb.), and quantity/quality of yield, the Hot Pepper Spray would be the best bet. However, it bears repeating, that if the flea beetles are no worse than recorded here, no technique at all need be used, saving time and money.

All the techniques requiring solutions (centrum, vit E and Hot Pepper Spray) are time consuming if done by hand. (about 15 minutes per thirteen foot row per week). If the problem with the reemay cover is heat build up, perhaps cooling watering more often would mitigate the heat problem, if ineed, this is the reason for the poor yield. This would add, however, to the time cost of the Reemay techniuqe, which was negligible.

There were no other insects on the vines which would cause holes etc. (e.g. potato bugs which had not been a problem at La Paix since 1984). However, helpful insects such as lady bugs, daddy long legs, spiders and praying mantis were seen (see Observation Notes on individual potato beds for details). One might conclude that the techniques used did not repel the good bugs along with the bad.

Overall Quality/Quantity of Potato Production

THE YEAR OF THE DROUGHT!

A random survey of potato yields in Lewis county reveals that many gardeners had very low poundage and small potatoes with plants dying of heat and drought a month to a month and one half early. Some farmers were fortunate and one tells me he had a 20 bushel yield from a planting of 2 bushels of Kennebec potatoes.

At La Paix, the research yield average was 24 lb per 8 lb or 3 times the amount planted. If the Reemay Bed is taken out of the average because of its very low comparative yield, the average would be almost 26 lb. per 8 lb. planting. The best bed (control) is four times the

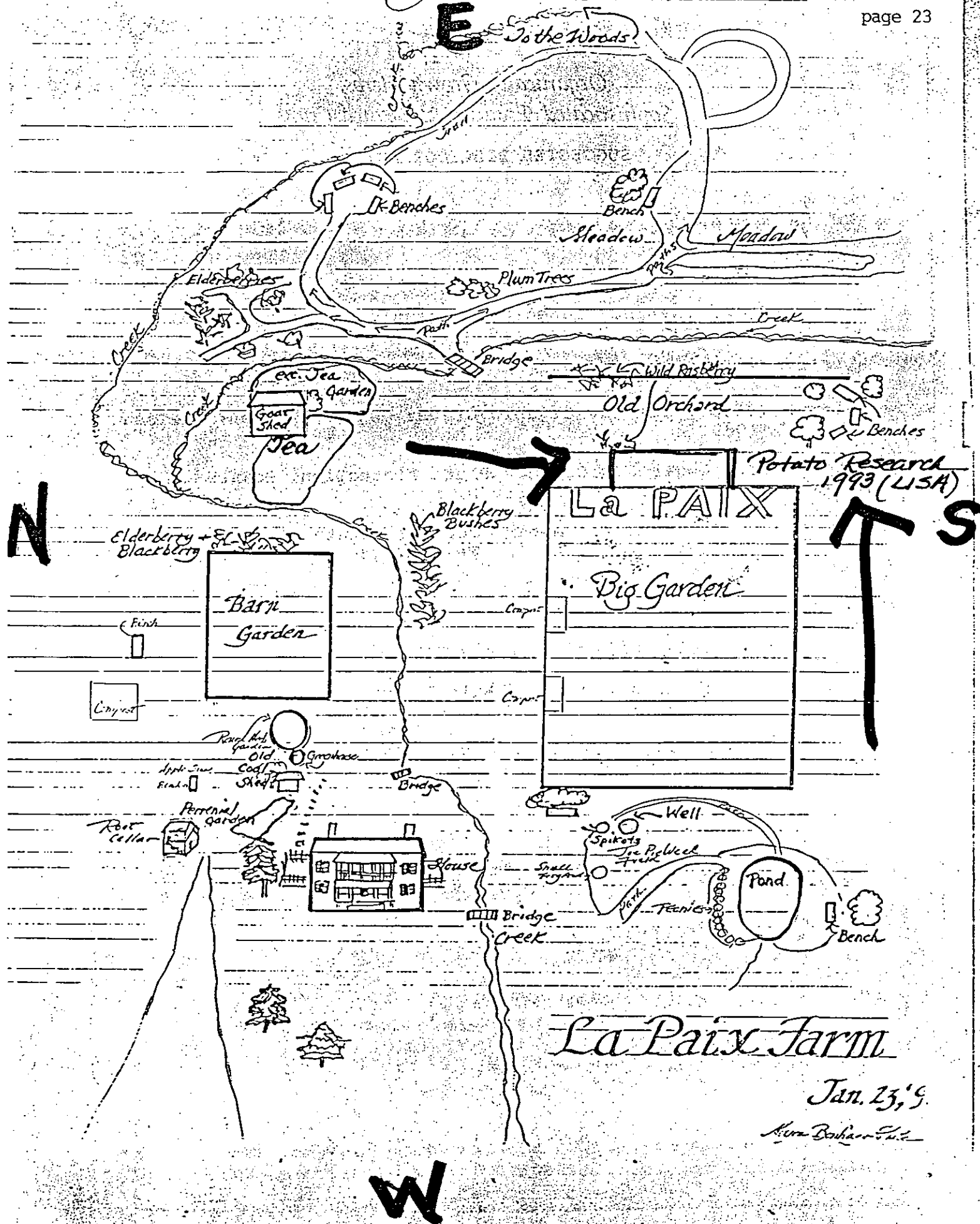
CONCLUSIONS (PAGE THREE)

the planting or 32 pounds.

To get better yield results in a similar situation, I would not use raised beds, but concave beds (to hold water) and water at least once a week for three hours or more. I think the results would be much better. (There was a total of 43 hours of rain in the major growing months - June, July, August). See Precipitation Data.

In addition, I would hill the rows with a higher concentration of organic matter and incorporate more organic matter in the soil preparation.

Overall Garden Plan



La Paix Farm

Jan. 23, '99

Mona Barbara Smith