MANAGEMENT REORGANIZATION
OF
THE EVERGREEN STATE COLLEGE
ORGANIC FARM

Draft Proposal

Submitted by:
FARM MANAGEMENT REORGANIZATION TASK FORCE

July 25, 1980
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INTRODUCTION

The Organic Farm has been operating at varying degrees of activity since 1971. At that time guidelines were set down for the management of the Farm. "The farm was to be a college project involving everyone at Evergreen."¹ The farm was to be governed by a general consensus of the farm users. These guidelines set the stage for use by academic programs and community members over the following years.

The Spring 1974 Farm Plan contained a revised three point policy statement concerning management of the Farm. This plan was further revised in the 1979 Plan and Evaluation for the Organic Farm.

1) Most important is that the farm always be an organic farm used to improve and experiment with organic methods of food production, biological pest control, companion planting, mulching, and related areas during all phases of development.

2) We consider it very important that the Farm continue to be open to use and input by varied groups and programs from Evergreen and the surrounding community, and that it not develop into an inflexible institution, or its use be dominated by one group or concern. However, we do suggest that the agricultural programs be given priority for use because of their maintenance of, and direct learning from, the garden.

3) Equally important is a policy for live-in student caretakers to

¹For a complete list of guidelines refer to The Evergreen State College Farm and Organic Garden Plan and Evaluation Spring 1974. Also refer to 1979 Plan and Evaluation for The Organic Farm.
be an integral part of farm operations. Another important point should be added to this policy.

- A main concern for all farm users should be a consideration for continuity, in research, crop rotation, and record keeping. The need for this additional point has become apparent during the past few years. A continuity can be established by a better organization of the farm.

The 1979 Plan and Evaluation also outlines a plan for a decision making body, a "Farm Board." "This representative group would provide a fair and responsible decision making body composed of those who are the most knowledgeable about the Farm and its operation." This central "Farm Board" plays a strong role in farm management.

The 1980 Management Reorganization for the Organic Farm is intended to act as a guideline for instituting a responsible form of farm management. The utilization of a stronger and more active Farm Board, and the addition of a "Farm Coordinator" are central to attaining this goal.

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2 Refer to page 8 of 1979 Farm Plan and Evaluation.
FARM COORDINATOR

The Farm Coordinator will carry out those organizational and managerial tasks most directly related to S and A supported activities. As the title suggests, this position will be primarily concerned with coordination of the various farm activities. See the following page for the Farm Coordinator job description.

Hiring of the Farm Coordinator will be a two step process:

1) Screening by a representative committee of farm interests and users (Farm Board).

2) Final selection by the Associate Director for Student Activities (Lynn Garner).

The screening committee will consist of at least one representative each of the Office of Facilities, Academics and the S and A Board. Additionally, two Caretakers, the program faculty, and two farm users, including program students, will be involved in the screening process.

This committee will perform preliminary interviews with the prospective applicants and make recommendations for hiring to the Associate Director for Student Activities.
THE EVERGREEN STATE COLLEGE ORGANIC FARM

JOB DESCRIPTION: Farm Coordinator

Starting pay:
Hourly at $3.35, raise to $3.60 after 400 hours.

Number of hours:
Paid: 12 hours per week, 12 weeks per quarter, 4 quarters per year.
Non-paid: 10 to 25 additional hours, possibly through an internship.

Starting date:
July 1, 1980.

Length of commitment:
Minimum of 6 months, maximum of 1 year. A full year commitment is preferred.

Previous experience:
One year or equivalent in coordination or managerial work.
One year of gardening, small farming or greenhouse experience or comparable college education.
Background in organic farming/gardening.
Involvement in the direct marketing of produce.

Skills required:
Coordination skills for the management of farm activities.
Firm, working knowledge of organic farming/gardening.
Budgetary skills.
Knowledge of marketing.
Ability to communicate effectively.

Responsibilities:
Manage S and A farm budget.
Responsible for generating revenue.
Coordinate community garden, workshop and outreach efforts.
Convene the Farm Board.
Carry out relevant policies and projects decided on by the Farm Board,
either by direct work or through delegation of work.
FARM BOARD

The Farm Board is a collection of persons representing the various interests and activities of the Organic Farm. This board will address medium to long range issues such as farm land use, project approval and coordination, budget design, revenue generation, and periodic farm evaluation. The membership of the Farm Board consists of two types: regular and ex officio. As seen in the accompanying diagram (pg 8), each of the major funding sources (see Appendix 1) has three regular representatives and one ex officio representative. Following is a complete list of the Farm Board members:

<table>
<thead>
<tr>
<th>Regular</th>
<th>Ex officio</th>
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</thead>
<tbody>
<tr>
<td>1 Farm Coordinator</td>
<td>1 Academic Dean</td>
</tr>
<tr>
<td>1 Community Gardens Rep.</td>
<td>1 Director of Facilities</td>
</tr>
<tr>
<td>1 Member-at-large</td>
<td>1 Associate Director for Student Activities</td>
</tr>
<tr>
<td>1 Academics Rep. (Lab Manager)</td>
<td></td>
</tr>
<tr>
<td>1 Program Rep. (Student)</td>
<td>3 TOTAL</td>
</tr>
<tr>
<td>1 Program Faculty</td>
<td></td>
</tr>
<tr>
<td>3 Caretakers</td>
<td></td>
</tr>
<tr>
<td>9 TOTAL</td>
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Selection of regular Farm Board members will be made by the group being represented, except in the case of those positions hired by separate

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3"A formal evaluation will be done during Winter Quarter of the second year of each biennium. A Farm Management Group, composed of representatives of students, faculty, and staff most actively involved with the Farm during that time space will carry out the evaluation." Organic Farm Plan and Evaluation Spring 1974, pp. 13
means (Farm Coordinator, Program Faculty, Academics Rep., and Caretakers). The Member-at-large position will be selected through a community forum or other similar gathering as initiated by the Farm Coordinator.

The basic responsibilities expected of regular Farm Board members will be to:

--- attend all meetings and abide by the Farm Board guidelines as proposed in this document;

--- be aware of the issues and activities of the farm;

--- communicate as needed with the group or interest being represented:

Caretakers-Facilities, Farm Coordinator-S and A, Academics Rep. and Faculty-Academics, and farm users as described above.
FARM BOARD ORGANIZATION

ACADEMICS
DEAN
Academics Rep.
Student Rep.
Faculty

FACILITIES
DIRECTOR
Caretakers (3)

S and A
ASSOCIATE DIRECTOR
Farm Coordinator
Community Gardens
Member-at-large

FARM BOARD

FARM OPERATIONS

Regular member
Ex officio member
The ex officio members will serve as advisors to the Farm Board. They will be informed of and encouraged to attend all meetings, but will not be directly involved in the actual decision making of the Farm Board.

The method of decision making practiced by the Farm Board will be consensus of all present regular members. A back-up system of majority voting and Farm Coordinator tie-breaking will be used only as a last resort. Although all Farm Board meetings are open to the public, only the regular members will participate in decision-making.

This body will serve an advisory function. Final approval of any Farm Board decision is necessary from the appropriate administrators. It is hoped however, that the decisions made by the Farm Board will for the most part be considered policy, since each of the administrative interests are being represented. (See Appendix 2, scenarios I and II for illustration.)

The Farm Board will be primarily concerned with policy recommendation and duty delegation. Specific tasks recognized by the Board will be assigned to the appropriate responsible person or group.

The issues to be addressed by the Farm Board will meet at least one of the following criteria:

1) any change in Farm policy;
2) any decision regarding livestock;
3) medium to long range land use decisions;
4) any decision affecting two or more funding sources.

The Farm Coordinator will be responsible for determining when a given issue meets one of these guidelines, and is therefore to be placed on the
agenda. As stated the Farm Board will deal with only medium to long range plans and issues, while the day-to-day farm operation decisions will be made by the farm personnel (Farm Coordinator and Caretakers).

The role of the Farm Coordinator in the Farm Board will be that of convener. This person will post the agenda and any available details of issues to be addressed one week to three days prior to the Farm Board meetings. As facilitator, the Farm Coordinator will ask for consensus when needed, and has the prerogative as representative of S and A to block consensus when necessary. This person, as other Board members, may call for the use of voting, but may only cast a vote in the event of a tie.

It is recommended that the Farm Board meet at least once a month. Frequency of meetings may increase during the first few months or during busy seasons at the farm. The meetings will be the first Wednesday of each month.
CARETAKER ROLES

Some changes in the roles of the Caretakers are expected as a result of this plan's implementation. The most obvious alteration will be a result of the new Farm Coordinator position. This will enable the Caretakers to direct more energy towards building and grounds maintenance and less toward S and A concerns.

Following is a proposed revision to the present "Farm Caretaker Policy" (Appendix 3) accounting for the changes that the Farm Coordinator and Farm Board will induce.
REVISED
FARM CARETAKER POLICY

General

Caretakers will work cooperatively to complete the designated responsibilities, however, each Caretaker will have primary responsibility for one specific area.

Prime responsibility for facility maintenance and custodial care rests with the Facilities Office, responsibility for coordination of all academic farm or garden programs rests with Academics, and responsibility for student activities rests with the Associate Director for Student Activities.

Hiring of Caretakers will be performed by the Director of Facilities based on the recommendations of a screening committee consisting of the Farm Board or a similar group representative of farm interests.

Caretakers will report to the Director of Facilities or his designee in the performance of their duties. They will work cooperatively with the Director of Facilities, the Farm Faculty, the Farm Coordinator, and the Associate Director for Student Activities.

Caretaker positions will run from six months to one year, with a full year commitment preferred. The positions will rotate in such a way as to insure at least one experienced Caretaker always present.

Caretaker positions will consist of both resident and non-resident positions. At least one of the positions will be a resident. There will be three, 19 hours per week positions funded through the College Work Study program, or as student employees. Caretakers will be paid on an hourly basis for services performed.

Duties

1. Farm House Caretaker

   A. Custodial

      1) The custodial care of the farm house must meet the same custodial standards required for the main campus. Custodial Supervisor Yuki Chancellor will review these requirements with the resident Caretaker(s), and perform inspections to insure that the farm house is kept in a neat and orderly fashion. Duties apply to both the residence and the public areas.
2) Caretakers will make any preparation which might be necessary prior to a group's activity as well as any cleaning necessary as a result of an activity. Individual groups utilizing the farm house shall clean up any mess created from their use and therefore the Caretaker's responsibility is to make sure that this is carried through, not to serve as a "maid."

B. Maintenance

1) All maintenance to the facilities and grounds is to be performed under the supervision of the Buildings and Grounds Supervisor, Dave West. The Farm House Caretaker will be responsible for minor maintenance and repair of the farm house and adjacent grounds. Requests for major projects should be processed on the Facilities Job Order Request Form.

2) Wood for use in the stoves shall be neatly stacked in the designated areas.

3) An inventory shall be maintained of all property contained in the house.

C. Scheduling

1) Scheduling of all College facilities is the responsibility of the Space Analyst, Office of Facilities. The Farm House Caretaker will work with the Space Analyst, Kris Robinson, in coordinating the scheduling of activities to take place at the farm house.

2) Building hours: The building hours and scheduling priorities for the public areas of the farm house are as follows:

<table>
<thead>
<tr>
<th>Time</th>
<th>Priority</th>
</tr>
</thead>
<tbody>
<tr>
<td>DAILY 8 a.m. - 5 p.m.</td>
<td>Academics</td>
</tr>
<tr>
<td>SUN-THUR. 5 p.m. - 10:30 p.m.</td>
<td>S &amp; A Activities</td>
</tr>
<tr>
<td>FRI.-SAT. 5 p.m. - midnight</td>
<td>S &amp; A Activities</td>
</tr>
</tbody>
</table>

3) The Farm House Caretaker will maintain records of all activities held at the farm house in terms of date and type of use to serve as a scheduling aid and for future reference.

D. Other Duties

1) Serve as member of the Farm Board.

2) Serve as security for the farm against vandalism and other such damages. The Security Office should be notified immediately upon the detection of any fire, theft or damage.
2. Grounds Caretaker

A. Maintenance

1) Maintain the trail from the main campus, keeping it clear of fallen trees, branches and other objects.

2) Maintain an outhouse. This includes digging new holes, liming and covering old holes as needed.

B. Other Duties

1) Provide evening, weekend and holiday support for ongoing academic programs. This includes watering, weeding, harvesting, selling produce, etc.

2) Provide guided tours of the farm, and keep maps and other visitor aides in current and presentable condition.

3) Keep track of community gardens, including records of fertilization, crops grown, etc. Provide support as needed.

4) Maintain records on all garden and farm activities, including outside weather data.

5) Serve as an information source for farm activities and garden practices.

6) Provide security for the farm.

7) Serve as a member of the Farm Board.

3. Buildings Caretaker

A. Maintenance

1) Be responsible for maintenance and repair of solar and plastic greenhouses, tool shed, red barn and all other farm structures.

2) Maintain all gates and fences for protection against deer and other animals. Build any new fences as needed.

3) Keep all out-buildings in a clean and organized fashion.

B. Other Duties

1) Provide evening, weekend and holiday support for farm activities.
2) Be responsible for support of greenhouses, including maintenance of temperature control in solar greenhouse, watering of plants, feeding of fish and record keeping of greenhouse microclimate weather data.

3) Maintain an inventory and check-out system for tools used on the farm. Perform any tool maintenance needed.

4) Provide for farm security.

5) Serve as a member of the Farm Board.
Subject: Fiscal and administrative responsibility for The Evergreen State College's Organic Farm and Garden.

Purpose of this agreement: Prior to the time of this writing the farm had been bounced between programs 060, 040 and 160 several times. It was hoped that this agreement would serve as a means for maintaining an attitude of joint ownership, of mutual respect and of shared responsibility between academic programs, plant operations and student activities.

Whereas both the instructional program (060) and the Services and Activities Fee Review Board (S & A Board) have supported the operation of the Organic Farm and Garden in part since 1972, and whereas the S & A Board allocated funds for construction of a new farmhouse during the winter quarter of 1975, and whereas plant operations has supported the utility operation of the farm fiscally since 1972, the following agreement is made relative to fiscal and administrative responsibility for the Organic Farm and Garden

1. Because of its value as an instructional resource and field laboratory, the institution, primarily through programs 040 and 060, will support its operational costs as well as share in the responsibility for establishing use policy and guidelines for caretakers and others.

2. Because of its value as a leisure pastime in addition to its instructional and field laboratory value, the S & A Board will hear requests for funds to support the purchase of agricultural equipment and supplies, and to share in the responsibility for establishing use policy and guidelines for caretakers.

3. Sharing in this regard means no decisions which would affect any of the parties involved would be made without mutual consultation.

Date June 25, 1975

Academic Budget Desk Dean

Plant Operations Representative

Services and Activities Review Board Executive Secretary

Student Activities Representative

bhn
3/25/75
APPENDIX 2

DECISION MAKING SCENARIOS

I. Issue- Location of manure pile and containment structure.

Steps- 1. Program students and community gardeners tell Farm Coordinator of need for larger, more centrally located manure pile with better access.

2. Farm Coordinator asks interested group to submit a proposal listing the benefits and drawbacks of the various options.

3. Interested group submits proposal.

4. Farm Coordinator posts proposal and adds to list of Farm Board agenda items.

5. Farm Board members look at agenda/proposal and consult with the body they represent as needed.

6. Farm Board meets. Decides which option is best.

7. New manure pile is built.

II. Issue- Remodeling of the red barn and the obtaining of a goat.

Steps- 1. Program students present the idea of obtaining a goat and remodeling the red barn, including the building of a fence, to the program faculty.

2. Faculty relays the proposal to the Farm Coordinator who posts the proposal and adds the issue to the Farm Board agenda.

3. Since the proposal calls for Facilities to fund the remodeling and fence building, the Caretakers confer with the Director of Facilities. Similarly the Farm Coordinator meets with the Associate Director for Student Activities since funding for purchase of the goat and feed has been requested from S and A.

4. The Caretakers are informed that the final approval for and funding or building alteration must come from the Director of Facilities. For budgetary reasons the Farm Coordinator and Associate Director for Student Activities decide that an animal project should be self supporting.

5. Farm Board meets. These parameters are presented at the outset of the discussion. It is agreed that a recommendation will be produced and presented to the appropriate administrators as requested.

6. The proposal is discussed. A recommendation is produced and presented. Action is taken.
GENERAL

Caretakers will work cooperatively to complete the designated responsibilities; however, each caretaker will have primary responsibility for one specific area.

Prime responsibility for facility maintenance and custodial care rests with the Facilities Office, responsibility for coordination of all academic farm or garden programs rests with the Academic department, and responsibility for student activities rests with the Associate Director for Student Activities.

Caretakers will report to the Director of Facilities or his designee in the performance of their duties and will work cooperatively with the Director of Facilities, the Farm Faculty, and the Associate Director for Student Activities.

Caretaker positions will consist of both resident and non-resident positions. The total number of positions being dependent on both work load and funding availability. Initial staffing will consist of two student positions funded under the College Work Study Program. At least one of the positions will be a resident caretaker. Caretakers will be paid on an hourly basis for services performed. Starting pay will be $2.90 per hour. The value of the residence will be considered $130.00 per month.

DUTIES

1. Facility

A. Custodial

1) The custodial care of the farm house must meet the same custodial standards required for the main campus. Custodial Supervisor Yuki Chancellor will review these requirements with the resident caretaker(s) and perform inspections to insure that the farm house is kept in a neat and orderly fashion. Duties apply to both the residence and the public areas.

2) Caretakers will make any preparation which might be necessary prior to a group's activity as well as any cleaning necessary as a result of an activity. Individual groups utilizing the farm house shall clean up any mess created from their use and therefore the caretaker's responsibility is to make sure that this is carried through, not to serve as a "maid".

B. Maintenance

1) All maintenance to the facilities and grounds is to be performed under the supervision of the Buildings and Grounds Supervisor, Dave West. Duties will include minor maintenance and repair of the buildings including: the farm house, solar greenhouse, red barn,
Farm Caretaker Policy
Page 2

2) The trail from the main campus to the farm must be maintained clear from fallen trees, branches and other objects.

3) The fences and gates shall be maintained in such a condition that the livestock will be contained in their designated areas.

4) Wood for use in the stoves shall be neatly stacked in the designated areas.

5) An inventory shall be maintained of all property contained in the house or assigned to the farm.

6) Maintenance responsibilities will include maintaining an outhouse. This will include digging new holes and liming and covering the previous location.

C. Security

The caretakers will serve as security for the farm to guard against vandalism and other such damages. The Security Office should be notified immediately upon detection of any fire, theft or damage.

D. Scheduling

1) Scheduling of all College facilities is the responsibility of the Space Analyst, Office of Facilities. The caretakers will work closely with the Space Analyst, Kris Robinson, in coordinating the scheduling of activities to take place at the farm house or anywhere on farm property.

2) Building Hours: the building hours and scheduling priorities for the public areas of the farm house are as follows:

   DAILY       8 a.m. - 5 p.m.   Primary Priority Academics
   SUN-THURS   5 p.m. - 10:30 p.m S & A Activities
   FRI-SAT     5 p.m. - 12 Mid.   S & A Activities

3) Maintain records of all activities held at the farm house in terms of date and type of use to serve as a scheduling aid and for future reference.
2. Academics

A. Provide evening, weekend and holiday support for ongoing academic programs, i.e. feed and water animals, water plants.

B. Manage the academic aspects of the farm: planning the garden design, ordering seeds, supervising field preparation, planting, harvesting, etc.

C. Provide guided tours of the farm.

D. Maintain an extensive log on all garden and farm activities including weather conditions.

E. Coordinate the marketing of produce both at the school and in the community.

F. Maintain records on budget. Control spending and assist in formulation of new budget proposals.

G. Maintain an inventory and check out system for tools used on the farm.

3. S & A

A. Maintain records of expenditures of S & A funds.

B. Prepare budgets for ongoing operations and new S & A projects for presentation to the S & A Board.

C. Coordinate with the Associate Director of Student Activities on student and community programs for the farm.
The purpose of establishing an orchard at the organic farm is to provide an area of experimental learning pertaining to tree crops in Agriculture. Permanent crops, such as fruit trees are an integral part of Small Scale Agriculture, therefore an Orchard will help to broaden the variety of crops being grown at the farm. In keeping with the overall goals of natural farming, no synthetic chemicals are to be used either for insect/disease control or fertilizing.

Joel Walker, a student in the 1980 As You Sow program, developed a plan for the establishment of an orchard at the Organic Farm. The plan was evaluated by some members of the 1980-81 Program and by Sam Benowitz and Michaela Dolan, orchardists in Morton Wa. (See Walker plan and Benowitz evaluation in the file). Many aspects of the plan require further research, and some future needs of the farm have yet to be clarified, in order for the Plan to be revised and adapted.

While the above investigation will continue on an ongoing basis by this and future programs, it was felt that the establishment of a small part of the orchard should be begun. In Feb 1981 the orchard was started with the planting of 11 trees. These trees were obtained from Sam Benowitz of Raintree Nursery. Sam is a small scale grower of nursery stock. The trees were earned by the students in exchange for labor at the nursery. The formula for earning trees is: one tree for every three hours of student labor.

The following trees were planted:

- Dwarf Apples: Akane, Chehalis, Melrose, Mutsu—these are dwarf trees on Malling 9 Rootstock. They will reach a height of approx. 6-8 feet. A trellis will be constructed behind them to support the branches, because when these trees reach their full maturity, they will need support for the weight of their fruit.
Dwarf Apples—Akane; Chehalis; Melrose; Liberty—these are the same varieties (with the exception of Liberty) on Malling 26 rootstock. These will obtain a height of from 8 to 12 feet, and do not require support.

The trees were chosen on these two rootstocks in order to observe the growth and yield on the two different dwarfing rootstocks.

Plums: Satsuma; Shiro and Green gage—These were chosen over the more common Italian Prune (which we already know does well in this area) in order to observe how these more unusual varieties will grow. Shiro and Satsuma will pollinate each other. Green Gage is a self pollinator.

Planting details: The trees were planted in holes dug deeper and wider than needed to accommodate the roots. This was done in order to create loose soil conditions below the trees for maximum root growth. Top soil was mixed into the hole with the subsoil. The tree was planted to the same depth as it was growing in the nursery, with the graft union well above the soil line. It is important not to bury the graft union in order not to have roots growing out from the scion wood. Permanent metal tags were affixed for identification, and metal vans were placed around the base of each tree to discourage rodents from gnawing at the bark of the tree. No fertilizer material was incorporated into the planting holes, as it is not recommended for new plantings. Nitrogen, in particular, is discouraged at this stage of growth as it would encourage leaf formation at a time when the trunk and branches should be making growth. Fruit trees require a neutral or slightly acid soil. A fence was constructed at the time of planting. Deer are a problem with young fruit trees and adequate protection in the form of fencing is required.
CONTINUITY—With the planting of these 11 trees the Farm Program is attempting once again to establish perennial tree crops. In the absence of permanent caring personnel, it is difficult to provide the continuity necessary to the establishment of a "permanent" crop. Adequate and detailed record keeping, as well as instructions for future care, should be provided by each group that cares for and experiments with these trees. A separate notebook will be established by the 1981 group to keep these records and plans pertaining to orchard work only.

WORK PLAN

Spring 1981 and Future Plans—

Spring Quarter: Complete the establishment of the current site as follows: 1 Clear cultivate around the trees
2 Mulch with available materials, for weed control and moisture retention.
3 Clear cultivate the area between the trees and plant with either a cover crop of clover or: turn it into more vegetable beds.

Note: it is important at this time to establish weed control as these young trees can easily be overrun with weeds which will outcompete them. It is also important to observe the new growth each year. A healthy tree will put out about 12" inches of new growth each year.

Pruning and training—The trees were pruned at the time of planting to compensate for the reduced root systems due to their being moved from the nursery to our site. The trees have been started with the 'central leader' method of shaping. In this method a single central leader is encouraged to grow upright. The branches are left around the tree in a wheel spoke arrangement.
Branches with a smaller than 45 degree crotch are removed.

5. Removal of young Doug Firs that are growing at the rear of the fencing. These should be removed for the prevention of root competition as well as to be able subsequently to incorporate this site with the future orchard site to the east.

6. Plant the container planting of the Kadota Fig tree and place near the house. The fig was a gift from Sam and it is an experiment to see how a containerized fig placed near the house will grow in this climate. It is self fertile and is not usually hardy below 10 degrees.

7. "HEDGEROW TREES" Some time in the past some trees had been previously donated by Sam. These are presently down on the border of the main garden bed. It is proposed that these be brought up to the new orchard site and incorporated within the protected area. They are labeled and according to our best information are also dwarf trees. In front of these trees are a row of many seedling rootstock and assorted 'junk' trees that were used for experimental and practice grafting. It is proposed that they be removed and given to whoever might like to grow them out.

ORCHARD EXTENSION - FUTURE PLANS - The site immediately to the east of the present site is to be developed for the expansion of the Orchard in 1982. This is the site that was formerly the community gardens. The 1981 Program recommends that the area be enclosed by a fence and the soil prepared to receive the planting next spring. The soil here is sandy loam and would benefit by the addition of organic matter. We recommend clear cultivating; adding compost, planting with two successive legume crops (clover, vetch) and turning this under each time. The soil should also be limed.
PLAN FOR A PERMANENT AGRICULTURAL DESIGN AT THE ORGANIC FARM

Joel Walker
As You Sow
1980
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BIBLIOGRAPHY LIII
I. Agri-sylviculture: Establishing principles and materials for the Pacific Northwest

II. World crises abound: hunger, decreased diversity in food crops, desertification, deforestation, soil erosion, wildlife habitat destruction, fuel shortages, pollution, atmospheric carbon buildup, and scarcity of raw materials for housing, clothing and other basic necessities comprise these crises. Pioneers in Agri-sylviculture such as J. Russel Smith ("Free-Crops", 1950); J Sholto Douglas and Robert A. de J. Hart ("Forest Farming", 1976); suggested that trees could alleviate nearly all of these critical problems. In addition to their calculations, it appears that trees could also play a major role in fixing atmospheric carbon which has been on the increase since the beginning of the industrial revolution. (W.S. Brocker, et al "Science", October, 1979) Historically, trees have played a major role in the demise or sustenance of cultures around the world. The Roman empire is a vivid example since its demise has been partially attributed to the destruction of Italy's savanna forests. Because this case was localized, it has not effected the biosphere appreciably. However, with worldwide deforestation and desertification on the rise, along with atmospheric carbon dioxide buildup, the demise of our whole planet is a real threat. Therefore, establishing principles and materials of agri-sylviculture for the Pacific Northwest is essential for a viable future.

III. Because of the long term nature of tree and shrub propagation, it is not probable that any results of an agri-sylviculture design will come about within my stay at the farm. Thus, it will be essential that a year to year journal be kept of observations made. This journal will begin with a record on research that I have done, planting procedures, maintenance procedures and first year observations. This paper will support the selected procedures and will also provide possible variations for future expansion of the plantings. My support will be derived primarily from present research being done by the New Alchemy Institute as reported in "The Journal of the New Alchemists" number 5, and previously mentioned references. Procedures for the actual planting have still to be determined. As far as a calendar...
of events, I hesitate to state any cause of possible delay in the
planting dates and the length of time needed for the research is still
an unknown. It may be best to post pone planting until next year
and this would then limit my involvement to the design. However,
if conditions permit, planting would begin April 2. Many people have
volunteered to help with the planting, but the research is my task.

IV. Working bibliography

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Joel H. Walker
2/11/80
PERMANENT AGRICULTURE: a KEY to ECOLOGICAL and SOCIAL STABILITY

ABSTRACT. Civilization is on a path of self-destruction and our present agricultural practices are largely to blame. Destruction of forests and the reckless tilling of the earth are compounding the problem of atmospheric carbon buildup, erosion and environmental quality. Although many groups of people are reacting to our present industrial society by forming communes, collectives, cooperatives and land trusts in an effort to improve the quality of life, this is just a beginning. This proposal submits that perennial or "permanent" agriculture is another step which may help halt this needless destruction.

Joel Walker
As You Sow
3/9/80
PROPOSITION

Throughout history trees have safeguarded and replenished the rich top soil of the earth. Many civilizations have fallen due, in part, to the destruction of forests. Most representative is the Roman empire which denuded the savannah forests of Italy and many of its colonies. The deforestation process according to Erik P. Eckholm (LOGING GROUND, 1976) came about by the clearance of farm land, grazing of herds, wood gathering for fuel and construction. It then progressed with the need for ships to fuel trade and war which, in turn, increased immigration into southern Europe further depleting these resources. Soon, the forests were gone.

More recently, we have seen whole regions in the United States, such as the southwest, turn to dust. Known as the "dust bowl", it was brought about by tilling the native grasses under and farming crops that could not deal with the occasional droughts and high winds typical of the area. This instance should be a warning of what could happen and indeed is happening to the midwest. Alarming statistics show that over the past two centuries, one third of the topsoil in the United States has been lost. This is true especially in the midwest.

In an effort to deal with the droughts of arid and semi-arid lands, we build elaborate energy intensive and water intensive irrigation systems. One such system
being used in eastern Washington, is the center pivot irrigation system. This system requires that all obstruction, such as wind breaks and hills, be removed leaving the soil highly vulnerable to erosion. In addition, this form of irrigation in this climate causes salinization of the soil. Salinization occurs when the downward motion of soil water is slower than the upward motion. This causes salt which would normally leach down to leach to the surface rendering the soil useless for most plant growth. Central to the use of this irrigation system is the production of annual foodstuffs, vegetables and grains, and tillage.

Historically, tillage of soil for annual crops has ravaged the land through erosion while necessitating the clearing of forests. Several side effects crop up as a result of these practices. Soil humus levels drop, soil flora and fauna reduce, wild life habitats are destroyed and silt accumulates behind dams. Silt accumulation behind dams is of major importance to residents of Washington as this reduces the potential of dams to produce electricity. Losing this cheap electricity, necessitates building nuclear power plants in order to feed the ever increasing number of center-pivot irrigation systems among other things. Integral to the building of dams and the use of center-pivot irrigation systems is further destruction of wildlife habitats. This process is occurring at alarming rates in Western Washington due to the influx of people, the expansion of industry,
businesses moving into fertile valleys, and clear cutting of forest timbers. The latter is best dealt with by changing the practice of clear cutting to select cutting. By doing so, landslides and floods can be reduced and fish spawning grounds preserved. However, they all reduce the quality and quantity of wildlife habitats. Agriculture based primarily on annual vegetables and grains relies on heavy uses of energy intensive petro-chemicals, machinery and irrigation. In addition, our practice of mono-cropping is highly vulnerable to collapse from disease and pests which increases the need for the use of petro-chemicals. For instance, cotton in the southwest is highly dependent on such chemicals to keep the bollweevils under control. A few years ago, vast areas were destroyed by bollweevils resistant to pesticides. This situation could repeat itself at any time with any crop. If this should happen with wheat, America's bread basket may not be able to feed even the population of the United States.

The question of how and why we have come to rely on such an unstable agricultural base is a dynamic one. For instance, an untitled article in "Good and Wild" (Volume 212, 1979) hypothesizes that the origin of tilled field agriculture is the product of "private property relationships, class conflict and all that we know goes with these." Furthermore, it states that, "for orchard management, longer term planning and greater social stability are required than is the case with annual grain cropping." This social perspective is
intriguing in that our society because of its industrial base is mobile. When we look into why we have become progressively more industrialized we find that wars were the catalyst that sprouted the seeds of industrialism rather than agrarianism. Relating the history of the Roman empire to the present path of the United States, one can draw many parallels. For instance, the destruction of the forests during the time of the Roman empire was due in part to trade and wars. The United States thrives on both trade and war at the expense of our natural resources, one of which is forests. Another parallel that can be drawn between the Roman empire and the United States is the practice of cutting forests for tilled field agriculture. Industrialism feeds on war and both cause people to be mobile. A mobile society is the basis of industry's labor resources. All of these factors have played their parts to create our present dependence on annual agriculture.

Our society had the choice to pursue either an agricultural base which might have kept farms diversified, or, as has happened, the pursuit of an industrial base. At the time that we made this choice, the small farm was still popular although the instability of the people did not lend itself to perennial foodstuffs. In addition, food trees were were not as adaptable to mechanization as vegetables and grains. Mechanization resulted in part from a decrease in farm labor. Therefore, farm families neglected the whole facet of orchards
and concentrated on annual foods to feed themselves and large farms continued to increase in size in order to produce enough food for the city families which were becoming more abundant all the time as people gave up their farms for urban life. The cities grew in size primarily as a result of war which required laborers to fuel the war industries. One of the major causes of war is colonialism. Colonialism, by definition, is control by one power over a dependent area or people by a policy advocating or based on such control. The United States advocates such a policy through corporate plantations and foreign aid in a fashion similar to Roman colonialism. A consequence of this, as Francis Moore Lappe' and Joseph Collins (FOOD FIRST, 1977) explain, is that "the most ignored but perhaps pervasive effect of colonial plantation culture is a narrowing of the experience of agriculture to plantation work, especially with tree crops, (which) has over generations robbed entire populations of basic peasant farming skills." It is obvious that if these parallels hold true, our culture is resting on an agricultural base that is highly vulnerable.

All of the aforementioned problems are by no means unique to the United States. In fact, their world-wide scope has made these problems more serious than ever before in the history of homo-sapiens. There is one common denominator to these problems and it is perhaps the most serious of all of our environmental manipulations: atmospheric carbon buildup (CO₂). Statistics compiled
C.D. Keeling ("Tellus", volume 25/2, 1973) have shown a steady increase of CO\textsuperscript{2} since the advent of the industrial era. The sources of this carbon come primarily from tilling soils thus quickening the breakdown of organic matter and releasing its CO\textsuperscript{2}, burning wood or any other matter, production of cement, and burning fossil fuels. Some speculate that if CO\textsuperscript{2} doubles, which is likely in our lifetime, the "greenhouse effect" will come into play. The "greenhouse effect" can be caused by trapping solar heat in the biosphere as a result of carbon reflecting radiation which would normally escape into space. This would then raise the temperature of the earth's surface. The consequences of a 1 to 2\textdegree C temperature increase includes the melting of polar ice thus raising the sea level and expanding the desert belts which are primarily located between 15\textdegree and 30\textdegree north and south latitudes. This expansion would put most of the United States in the desert belt range. If this were to happen, and our present loss of agriculture continued, it could be the straw that breaks the camel's back. Another consequence of this temperature increase would be a reduction in the capacity of one of two major carbon sinks: the ocean. An increase in atmospheric temperature would be followed by an increase in ocean temperatures. This would cause the oceans to boil out more carbon and reduce the ocean's capacity to hold carbon. Therefore, it is the sole job of forests, the second carbon sink, to fix into organic material atmospheric carbon. It is fortunate for us that this biological machine is so efficient. For instance,
despite all of the forest fires, logging, and deforestation of the past two decades W.S. Broeker et al ("Science", 1979) estimate that "the regrowth of forests cut in the past may well have compensated for much of the recent cutting."

Combining forestry and agriculture, with the help of today's increased knowledge and technology, could create an agricultural system that is ecologically sound and will alleviate the aforementioned problems. Now comes the question, how can we deal with these problems? We mentioned the phenomenal ability of forests to grow and, therefore, fix atmospheric carbon. Yet this growth has only paced the destruction of forests which leaves fossil based CO² on the increase. By planting food producing trees on marginal lands and on deserts as J. Nussel Smith (TREE CROPS, 1950) suggests we can provide a larger CO² sink. The potential for increasing the capacity of forest sinks is great when one considers Smith's estimate that "of the world's surface, only eight to ten percent is at present used for food production... (by) growing food yielding trees in the most unlikely locations—rocky mountainsides and deserts... at least three quarters of the earth could supply human needs, not only of food but of clothing, fuel, shelter and other basic products. At the same time, wildlife could be conserved, pollution decreased, and the beauty of many landscapes enhanced with consequent moral and cultural benefits." Perennial agriculture would also decrease and, in many cases, could eliminate the need to till. This would have
many benefits. It would slow the release of $\text{CO}_2$ that is naturally bound in humus. Erosion would be reduced above and beyond trees' ability. Leguminous cover crops could be grown around the trees to feed livestock and be cut to make mulch. The livestock manure would help mulch to decompose while adding additional fertilizer to the nitrogen already supplied by the legumes. Humus would be continually added from the mulch and tree litter. The tree litter in turn would supply many of the leached nutrients. Under these conditions soil flora and fauna would flourish. Nyle C. Brady (NATURE AND PROPERTY OF SOILS, 1974) gives adequate support to all of the above. Trees are also well suited for drip irrigation systems which are both energy efficient and water conserving. This would have obvious benefits in eastern Washington. Western Washington could benefit from permanent agriculture in many ways. Some examples are: trees, because of their "powerful questing roots" can bring to the surface minerals that are so rapidly leached by rain reducing the need to apply fertilizer, leguminous trees, shrubs or herbage could be interplanted to supply nitrogen while supplying food for cows at the same time. Smith (TREE CROPS, 1950) estimates that by doing the above one can achieve 150% production. Inter-planting trees also helps to diversify our sources of food giving more stability. In addition, this makes a better preserve for birds. The birds, in turn, keep bug populations down decreasing the need for pesticides. Trees are well suited for the mountainous or hilly terrain of Western Washington. Dougless and Hart (FOREST FARMING, 1976)
claim that tree crops require "no expensive field
operations or heavy capital outlay on machinery. Labor
needs are very low and the burden of general work
is lightened.

Above, I have listed only a few of the more specific
attributes of permanent agriculture. The list of
overall benefits, part of which includes nutritional
superiority of tree food over hybridized and chemically
treated vegetables and grains, higher potential for
per acre food production, and resistance to drought, is
extensive. However, improving the quality of life is
probably the most important attribute of trees. Through­
out the world, there are people who need, or desire,
a better life. In the United States and specifically
in western Washington we have groups of people forming
communes, collectives, cooperatives and land trusts.
They are rejecting many of the values associated with
private property and revitalizing an ancient value system.
These people are looking for symbiotic relationships
and self-sufficiency. They are creating a climate
of permanence that will allow permanent forms of agri­
culture to flourish. Douglass and Hart in their book
(FOREST FARMING, 1976) realize this when they claim
that, "better than any other crop, trees could supply
the younger generations' demand for self-sufficiency...
In fact, communities could supply themselves with all
their dietary requirements of proteins, carbohydrates,
fats, minerals, vitamins and other nutritional factors as well as their basic needs of fuel, clothing and shelter and many profitable surpluses—without any arduous expensive and uncertain processes associated with cultivation of annual crops." Cooperatives, collectives, communes, land trusts and the like are the most likely to benefit from the establishment of permanent agriculture. Because these groups hold land as property of no one and regard themselves as caretakers of the land, the seeds of a land ethic will sprout and grow into a sense of permanence that trees so aptly represent. Therefore, the spread of permanent forms of agriculture is essential for a more stable, viable agricultural base. Establishing principles of and materials for such an agricultural base in Western civilization will take us one step nearer these goals.
Research will be essentially in three stages. First, there will be a survey taken of the area using a modified form of Dobgre and Hart's (FOREST PRACTICE, 1976)

FORM OF SURVEY FOR THE COLLECTION OF INFORMATION ABOUT A LOCALITY AND ITS USEFULNESS FOR THE GROWING OF TREE CROPS

PROJECT:

PART I - ECOLOGY

(a) Site:

(b) Natural vegetation:

Trees, Shrubs, Grasses, Other types

Barren Species, genus

Present vegetation:
(if changed by developments)

Life forms:
(Note if drought resistant, conventional, or other types)

(c) Habitat factors:

(i) Climatic:

Rainfall (monthly average in inches)


Humidity

Saturation deficit

Wind (prevailing and intensity)

Temperature (monthly average in °F or °C)

Minimum

Jan. - Dec.

Light (average hours)

Jan. - Dec.

Other influences

(ii) Physiographic

Elevation (above sea level)

Slope

Aspect

Soil type

Sediment

Field air in inches
Waterlogging,
Salinity
Other influences
(iii) Edaphic:
Soil type
Soil mineral matter: Coarse fine silt clay other
Mechanical composition: sand
Organic matter
Human and organisms
Solution acidity (pH)
Soil water: Hygroscopic Capillary Gravitational
pH (unavailable) (available)
(water table)
Soil atmosphere and drainage
Soil temperatures
Other influences
(iv) Biotic
Human activities
Animals (grazing, trampling, etc.)
Plants (preferences, light and shade or microclimate, competition, spread and other relevant matters)
Pests and diseases: already in evidence

(d) General:
(Enter any further comments including likely effects, adverse or favourable, of developments upon the local and adjacent habitats.)

PART II - ECONOMICS

(a) Economic factors:
(Mention markets and costs)

(b) Situation:
(Transport facilities, and other important details)

PART III - SILVICULTURE/PASTURAGE/

LIVESTOCK

(a) Cultural facilities afforded:
Trees and shrubs:
Grasses and herbage:
Livestock (types):

(b) Special requirements:
Environmental limits:
(Heat, cold, aridity, salinity, etc.)
Conservation:
Controls:
Buildings and equipment:
Other needs:
Any further factors:

Second, this information will be analyzed in order to research and select the types of planting materials that would be suited for The Evergreen State College Organic Farm microclimate. In doing so, a list of basic planting materials will be established for western Washington. Third, a plan design for an actual orchard will be drawn up. Carrying out this survey will require the use of the library for researching yearly climatic variables, natural vegetation, and other biotic influences. In addition, the survey will require the use of a soils lab to determine some physiographic variables such as salinity along with some edaphic variables including humus and organisms, pH, and soil water characteristics. Additional tools needed will be a trowel, 1/2 pint container, spatula or broad bladed knife and clean sheets of paper. Finally, a drafting table and tools will be needed to draw up the design.

**Calendar:**

March 23, 1980 - Survey completed
May 14, 1980 - Survey analyzed and planting materials selected.

June 4, 1980 - Design completed.

PARTICIPANTS:

Joel Walker - student

Fred Stone - advisor
The following description is of the Evergreen State College farm which is located at 2712 Lewis Road N.W. The farm is approximately nine acres, four of which are cultivated, two are uncultivated and unforested, and three acres are woodland. We will be considering only the cultivated areas. In order to identify the various perennial planting sites, the areas will be designated as follows:

"Upper Orchard" - the area on the highest part of the cultivated areas mostly south and a little west of the farm house. It is presently the sight of community gardens and is to be fenced in in the near future.

"Lower orchard" - the area on the small hillside directly west of the "upper orchard." It includes the east grain fields and the strawberry beds.

"Grape arbor" - located in between the "upper" and "lower" orchards at the crest of the small hill.

"Espalier apples" - located along the length of the eastern edge of the French intensive garden.

"Blueberries" - located along Lewis Road and along the farm driveway entrance. Peripheral plantings of trees will be located, according to their numbers, as shown on the master plan on the bulletin board near the main gate to the garden.

"Alder hedgerow" - located along the south fence of the main garden and at the crest of the hill.
between the lower orchard and the barn.

"Proposed access road to grain fields and barn" -
runs from Lewis road through the woods west of the
main garden fence to the edge of the hedge along
the south fence all the way to the barn.

For further orientation on the above areas, one should
consult the master plan of the farm located on the
bulletin board near the main gate to the garden. Trees
in the upper and lower orchards will be referred to by
number designated according to their special requirements.
History: There are two original types of soil on the farm according to the 1947 soil survey of Thurston County. They are Everett gravelly sandy loam and Giles fine sandy loam. The former is loose, gravelly poorly assorted glacial drift that originated mainly from granite and quartzite and some other rocks. Drainage is excessive and runoff is slow. The latter soil type is mainly sandy outwash materials, but there are layers of silt and very fine sand in the lower subsoil and substratum. Thin layers of silty clay also occur. Drainage is medium and runoff is slow.

Vegetation: Both soil types were originally covered with Douglass fir interspersed with western red cedar, western hemlock, and deciduous trees such as red alder, broadleaf maple, vine maple, madrona, and willow. The more common shrubs were cascara, dogwood, elderberry, wild cherry, serviceberry, hazelnut, and oceanspray. The understory was a luxuriant and dense tangle of salal, blue huckleberry, blackcap, snowberry, Oregon grape rhododendron, and rose. These plants are associated with bracken fern and sword fern.

Modifications: Presently, the area under consideration is cultivated and has been for many years. As a result, the soils have been modified. Following are statistics relevant to this study taken from soil sample results of a March, 1979 study. Please see page 4.
<table>
<thead>
<tr>
<th>Plan</th>
<th>N</th>
<th>K</th>
<th>Ca</th>
<th>Mg</th>
<th>Texture</th>
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<tr>
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<td>5.3</td>
<td>4.0</td>
<td>200</td>
<td>4.00 1.00 Sandy lom</td>
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<td>Lower orchard</td>
<td>N-6.5</td>
<td>6.5</td>
<td>4.4</td>
<td>400</td>
<td>6.00 1.25 Sandy loam</td>
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<td></td>
<td>S-5.7</td>
<td>5.7</td>
<td>3.0</td>
<td>150</td>
<td>3.36 0.74</td>
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<tr>
<td>Grapes</td>
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<td></td>
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<tr>
<td>Filberts</td>
<td>6.0</td>
<td>6.5</td>
<td>7.1</td>
<td>295</td>
<td>6.00 1.34 Sandy loam</td>
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<td>Blueberries</td>
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<td>4.90 1.01 Silt loam</td>
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<td>35-nut</td>
<td>6.2</td>
<td>5.8</td>
<td>1.9</td>
<td>187</td>
<td>5.52 2.81 Loam</td>
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<td>36-nut</td>
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<td>160</td>
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<tr>
<td>36-mullberry</td>
<td>Same as Blueberries</td>
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<td></td>
<td></td>
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<tr>
<td>46-mullberry</td>
<td>Same as Filbert</td>
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</tr>
<tr>
<td>47-nut</td>
<td>Same as South Lower Orchard</td>
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<tr>
<td>50-fig</td>
<td>?</td>
<td>?</td>
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<td>?</td>
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</tbody>
</table>

Weather:

<table>
<thead>
<tr>
<th>Month</th>
<th>Avg. Rainfall in Inches</th>
<th>Relative humidity in % of max. air can hold at given temp.</th>
</tr>
</thead>
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<tr>
<td></td>
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</tr>
<tr>
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<tr>
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</tr>
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</tr>
<tr>
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</tr>
<tr>
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<tr>
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<tr>
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<td>93 69</td>
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<tr>
<td>Oct.</td>
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<td>93 81</td>
</tr>
<tr>
<td>Nov.</td>
<td>8.02</td>
<td>91 85</td>
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</table>
Animals: Deer and mice are abundant in the area. These two animals are the biggest obstacles to the establishment of an orchard. Most of the other animals in the area such as snakes, fox, rabbits, birds and moles are of no great concern. Please see "fencing" section for the details of methods for protecting trees from mice and deer.

General: The farm as a whole is well protected from high winds. Competition from the surrounding forest, however, is of some concern. Some areas of the orchard will have considerable competition for light and nutrients. In some cases, such as stands of small alder, this might be beneficial as alder fix nitrogen.

The following recommendations are formulated from the site analysis, from research, personal contacts, and lectures on perennial agriculture. Many concepts gleaned from "As You Sow" are also taken into consideration.

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<td>49.4</td>
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<td>55.0</td>
<td>29</td>
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<td>Aug.</td>
<td>SSW</td>
<td>6.6</td>
<td>63.6</td>
<td>35</td>
<td>57</td>
</tr>
<tr>
<td>Sep.</td>
<td>SSW</td>
<td>7.1</td>
<td>88.2</td>
<td>29</td>
<td>48</td>
</tr>
<tr>
<td>Oct.</td>
<td>SSW</td>
<td>8.2</td>
<td>52.6</td>
<td>23</td>
<td>31</td>
</tr>
<tr>
<td>Nov.</td>
<td>SSW</td>
<td>8.9</td>
<td>44.7</td>
<td>4</td>
<td>20</td>
</tr>
<tr>
<td>Dec.</td>
<td>SSW</td>
<td>9.9</td>
<td>40.8</td>
<td>7</td>
<td>18</td>
</tr>
</tbody>
</table>

* Of light producing a distinguishable shadow in relation to day length
1. Any soil that has been uncultivated should, ideally, be cover cropped or cultivated in some other manner for two years prior to planting. This is done to add organic matter to the soil and reduce the number of weeds to a minimum. At the farm, there are only a few places that have not been cultivated so there is no need to wait two years. However, any places that aren't put into production this winter should be cover cropped with winter rye. A light mulch can be applied to aid in keeping weeds down. This should be done in September.

2. Dig holes one foot wider and deeper than the roots and backfill with good topsoil or leached compost. The purpose of using leached compost is to add humus but not nitrogen to the soil. Nitrogen, in the early stages of tree growth will cause the foliage to grow too much making the trees more susceptible to winter freezes. In addition, the roots will have no reason to search for nutrients and will be underdeveloped and unable to sustain the foliage growth once they reach the native soil. (Refer to the planting diagram in the appendix.) Growing fruit trees organically should be viewed as a long term investment and the trees should not be pushed beyond their normal and firm growth.

3. Construct fences for each individual tree according to the model north of the plastic greenhouse. (See also, the fence diagram in the appendix.) Although there will be fences around the perimeter of the entire area to be planted, it is imperative that each tree be fenced.

*Another time table for cultivating and pest prevention is offered at the end of DEFICIENCY SYMPTOMS AND CORRECTIVE MEASURES*
This is because of the many activities going on at the farm and the sometimes forgetful nature of the people working at the farm. If the gates of the main fences were accidentally left open, and a deer or two got in, the deer could kill or at least set the growth of the trees back several years in one hungry flight. Both digging the holes and constructing the fences, should be done before the trees arrive.

4. In late February or early March, the trees should be planted according to the planting diagram in the appendix. This planting time schedule is highly recommended since the trees will still be dormant and most of the severe freezes should be over.

5. Mulch around the trees one foot beyond the drip line of the foliage for the entire growing season. Mulching helps retain moisture, keeps soil temperature from fluctuating severely, adds humus to the soil and defines the limits to which gardening can be done around the trees. Mulch also keeps the fruit on the ground from rotting.

6. Sow and lightly mulch winter rye in late October. Sowing a cover crop will help retain nutrients over the winter and, at the same time, provide protection against winter freezes which could damage the roots. If a tree tends to put on too much late summer growth, it would be wise to sow a crop of buckwheat earlier on. This will reduce the available nitrogen in the soil and slow the growth of the tree. Provide enough water to minimally maintain the tree’s turgor. Remember, there is no hurry for the trees to produce.

7. Cut the rye when the buds start popping. This is done at this time because we want the majority of the tree’s
growth will have time to harden off before winter. The cut rye will act as mulch, reduce competition for nutrients, release the nutrients it conserved, and add organic matter to the soil.

8. Apply one inch of well composted material in a three foot wide circle at the drip line of the trees. This should be done immediately after the cover crop is cut. The reason for applying the compost is that most root activity occurs at the drip line. This ingenious adaptation provides the tree with additional water as its leaves divert much of the rainfall to its outer edges. Also, trees shed nutrients through their leaves which, as a result of the above process, are recycled and rerouted to different parts of the tree. The compost should include the following: chicken or mink manure, for the high nitrogen content, seaweed for its trace minerals, weeds of all types especially vetch, cornstalks ragweed, poplar and peach leaves, leaf mold and dandelions for their high concentration of those minerals commonly leached in this area. (See MINERAL DEFICIENCIES AND CORRECTIVE MEASURES for specifics.)

Caution with the above procedure should be taken as it may cause the trees to grow too rapidly in the early years of life. It may be best to completely skip the composting of young trees, and simply observe them closely for mineral deficiencies.

9. Add more mulch. Additional mulch may be needed to keep weeds down.

10. In late October or when the fruit is picked, the preceding procedures should be repeated except, of course steps 2, 3, and 4 which are one time chores.
Raff St. Louie, an elder of dry land orcharding in Eastern Washington, believes that trees should be hardened off to their environment. He waters his trees only when they show signs of wilting. In order to keep moisture from being wasted, he mulches heavily in early spring when the snow is melted around the trees to the drip line. In between, he dust mulches. He believes weeds rob too much water in the summer so clean cultivation is essential. However, many other orchardists believe weeds can be beneficial to orchards as they harbor predators of pests. This is not a problem, in Raff's case, since he has a small orchard with lots of weeds around it. However, dusty places are where most aphids thrive since their predators cannot deal with them there. Aphids, to many people, are a problem. They can infest trees and cause damage to the terminal growth and leave a sticky residue on the fruit. On the other hand, aphids might be of benefit in a well balanced orchard ecosystem. For instance, many chemical growers spray trees with a chemical that thins the weaker fruit from the "king" fruit. This is done in order to increase the size of the fruit that is left and to prevent clusters of small fruit. The chemical acts on the tree as a stressor which causes the tree to switch on a mechanism that causes the weaker fruit to drop.

Considering that organic tree growth should be slow and that aphids act as stressors on trees, according to the Fruit Tree Research Station in eastern Washington, but do not normally kill them, it would seem logical that some
Spittle on trees would act as natural thinners. This possibility would be worth some preliminary research to determine its validity for further controlled research.

A well balanced orchard ecosystem is delicate. From my studies and communication with orchardists in eastern Washington, it has become clear that to grow organically, one needs to observe the following criteria: 1. Isolation from all chemical sprays so there is no drift from neighbors. 2. Patches of totally wild areas interspersed throughout the orchard. This would act as a shelter for predators when the surrounding area is disturbed. 3. Minimal to no tillage. Tillage disrupts the natural flow of organisms and materials.

The orchard floor should be like a forest floor, i.e., layers of material building up over the years and incorporated by worms, moles and other tillers of the soil. Tillage is harmful to the roots of the trees and destroys the tilth of the soil.
and grow deep. This is why the hillside between the upper and lower garden was chosen for them. In addition, grapes need a lot of light and heat in order to ripen properly, and the section on the farm produces both.

Heat is the most critical factor to consider when growing grapes in western Washington. In the Olympia area, we average 1963 heat units (heat units (base 50°) are the accumulated difference between mean daily temperatures and 50° (base temp) from March through October) which is very low compared with most grape growing regions of the world. 1500 heat units is about the lowest measure at which grapes can be grown. It is for this reason, that the varieties selected are early bearers.

Even with these early bearers, special cultural practices are needed. Following, is a method of cultivating that will help produce well ripened grapes.

1. Plant the grapes along the old fence line using the posts to stretch heavy gauge wire for a trellis.
2. Plant according to the planting diagram in the appendix.
3. Instead of mulching with organic matter, mulch around and two feet on both sides of the row with solid black rocks. This will absorb heat and release it day and night.
4. Fertilize with compost teas in small amounts for the first half of the summer.
5. Clean cultivate within the bounds of the rocks.
6. When the fruit begins to ripen and it is cool out, plastic can be spread over the entire trellis to help hold heat as a greenhouse would.
Should problems arise, refer to the DEFICIENCY SYMPTOMS AND CORRECTIVE MEASURES section of this paper, consult the Skagit Men's Gardening Club in Mount Vernon for expert advice, or send soil and leaf samples to the Western Washington Research Station for an accurate analysis of mineral deficiencies.
Blueberries are lower maintenance and potentially higher profit fruit bearing plants than any in the core orchard. This is because of their suitability to the Pacific Northwest and to the popularity of the fruit.

Blueberries require a pH of 4.0 - 5.5, less nitrogen, calcium, phosphorous, potassium and magnesium than most fruit plants. Thus, the need to add these commonly deficient minerals is reduced. The site where the blueberries are located is silt loam. This should suit them well as blueberries have a fine mat like root system which is easily damaged by drought. However, there are some cultivating requirements which need to be observed. Following, is a procedure for site preparation and maintenance that should alleviate the problems of adequate moisture, initial nitrogen needs, and organic matter.

1. Swamp peat should be added to the soil. There are many areas around Everett where peat is available without cost. Eberhardt Nursery is a good resource for this information. The peat helps to add organic matter and supply nitrogen. Eberhardt Nursery suggests 1/2 peat to 1/2 sand for potting mixture however, in the field this would be impossible. The rule, then, is to add as much peat as possible. Peat also has fungi that are beneficial to blueberry growth. If unable to get peat, use forest leaf and needle mold to bring the pH down.

2. Apply lime to raise the pH if necessary. The pH at the recommended site was 5.9 in March of 1979.

3. Plow both of the above into the soil.

4. Dig holes and plant as indicated on the planting diagram.
the exception, is the substitution of 1/4 sand to 1/2 sand mixture for backfill.

5. Spread cow or horse manure at the rate of two to three tons per acre.

6. Mulch with sawdust or cardboard. Mulching is very important as it keeps competition for water from weeds down, retains moisture, reduces temperature fluctuations, adds organic matter and eliminates the need to cultivate.

7. Maintenance requires a cover crop of rye sown in the fall and cut in early spring. Mulch with sawdust or cardboard over the cuttings. If any deficiencies occur, consult the DEFEICIENCY SYMPTOMS AND CORRECTIVE MEASURES section of this paper along with some knowledgeable resource people, such as the people at Eberhardt Nursery, or send soil samples to the Extension Service for analysis.

Eberhardt Nursery has six or seven different varieties of locally developed blueberry strains and they are willing to donate five of each strain to the organic farm.

Blueberries have fewer diseases and pest problems than other berries. Deer don't eat them and disease does not readily attack them.
NUTS

Nuts provide a complimentary facet to the fruits as they relate to human nutrition. We will briefly relate some basics about filberts, walnuts and chestnuts for the prospective nut grower.

Filberts require less pruning, fewer sprays, have a less critical time of harvest and are less perishible than fruit crops. They begin bearing in three to four years and produce heavily in seven years. One problem with filbert production is that the eastern filbert blight is now established in this area. Because of this, it would be wise to delay extensive planting at this time.

Filberts do best in deep, well drained soils with high organic matter. In the areas best suited for filberts on the farm, it will be necessary to add organic matter. They also respond favorably to annual applications of nitrogen fertilizer. Chicken manure or compost should be added in late February to one foot beyond the drip line of the trees.

Mulching is important for keeping weeds down, conserving moisture, and adding organic matter. Pruning is required. Young trees are pruned and trained to develop a balanced framework of three to six scaffold branches. Prune mature filbert trees moderately each year to stimulate stem growth. The best nut production comes from stems which are six to nine inches long. Juckers should be cut. Common pests are worms inside the nuts and leaf tiers or aphids on the foliage. The latter usually do not require any treatment.

Walnuts do all right in Western Washington however, some years, the nuts do not get a chance to dry before the rains
Storing them in a dry place may help. The trunk of the Persian walnut needs to be kept dry in order to deter fungi from attacking the tree. Digging around the base to the first set of roots and filling in with sand or rocks should keep water away and give good air circulation. If the soil is clay-like or wet, Persian walnuts should be grafted onto California black walnut rootstock as it resists oak root fungus. P.H. 65 is best. Black walnuts are probably better suited for this area than Persians because of their relative resistance to fungi and adaptability to wet soils.

P.H. 65 is best.

American chestnuts are near extinction as a result of a fungus disease. However, recently a mutation of this disease that only sickens the tree has been found. If the chestnut is inoculated with this strain, it will build up a natural immunity to the killing strain much as the small pox vaccination functions in human beings. P.H. 65 is best. Chinese chestnuts grow wherever peaches can grow. They are better suited to acid soil, PH 5.5.

Generally, nuts are less prone to pest attacks, require less labor and are more self-sufficient than fruit trees. They should be allowed to grow unpruned with the exception of clearing dead or ill-placed branches and filberts.
1. P.H.

A. Detecting deficiency-test the soil at the drip circle of the tree and the middle of the rows with standard P.H. kits.

B. Corrective measures-raise the soil pH from 5.5 to 6.5 by applying two tons of lime per acre to the sandy loam of the orchard area. Depending on the need for magnesium or calcium, add either dolomitic lime or regular lime. Magnesium is usually needed.

II. Nitrogen (N)

A. Detecting deficiency-the leaves of nitrogen deficient trees are smaller than normal and pale green. The shoots are usually shorter and the bark may have a reddish tinge. Growth is restricted, fruit size is reduced, and production is poor. Fruit color, however, is enhanced. On peach, severe deficiency causes reddish leaves. Dead spots on the leaves may form and fall out causing "shot hole" condition.

B. Corrective measures-fish emulsion, dried blood or fowl manure will correct nitrogen deficiency quickly. Good compost and succulent legume green manure crops will act slowly and last a long time. The legume green manure should be a winter cover crop which is cut in the late winter or early spring before the buds appear. Compost should be added at the same time but should only be needed every three to five years. Do not apply any nitrogen after June as this will bring on late foliage growth which makes the trees prone to frost damage.
III. Phosphorous (P) No fruit trees in Washington respond to P therefore, there is no need to add it.

IV. Potassium (K) Rarely low

A. Detecting deficiency—this can be a problem in all tree fruits. In 'Comice' pear, it causes purplish browning of the edges in spur leaves. The deficiency can be found in all type of soils. However, it is most often associated with poorly drained fine textured soils.

B. Corrective measures—add humus. Seaweed meal and wood ash are quick remedies. Seaweed mulch, granite dust, or greensand releases potassium slowly for years.

V. Calcium (C) Occurs in acid soils—below P.H. 5

A. Detecting deficiency—needs for calcium or lime are best detected by PH soil test. Visual symptoms are stunted growth, small leaves, few roots, and young leaves turn yellow-green. The sandy loam of the orchard site is prone to calcium leaching.

B. Corrective measures—see PH instructions—add humus for better holding capacity.

VI. Magnesium (Mg) Commonly deficient in western Washington soil

A. Detecting deficiency—magnesium is a problem only on apple. Symptoms vary from variety to variety and orchard to orchard. Yellow areas develop between the veins and along the edges of older leaves in late summer. These areas may die and turn brown. Many of the affected leaves drop prematurely. Seriously deficient trees may lose more than half their leaves by harvest time and the fruit does not attain marketable size. Magnesium and iron are similar in deficiency
V. Corrective measures—Add dolomitic limestone. Seaweed is also rich in magnesium.

VII. Sulfur (S) Commonly deficient in the Pacific Northwest
A. Detecting deficiency—Poor growth and pronounced yellowing of the leaves. The yellowing is more intense than with nitrogen deficiency, but, otherwise, the symptoms are similar.
B. Corrective measures—Add humus, particularly seaweed

VIII. Boron (B) Commonly deficient in SW Washington
A. Detecting deficiency—the effects are similar in apples, pears, and apricots. The most common symptom is cork development—the tissue becomes dry and withered. If this occurs while the fruit is small, growth will be slowed and the fruit will fail to size. If the cells in the skin are injured because of boron deficiency, a rough, scabby skin will develop. However, the fruit may crack without showing noticeable cork. This is especially true of apricots. Such cracks may appear anywhere on the surface of the fruit—cracks that appear only in the suture of apricots are not necessarily due to a boron deficiency. The deficiency may also cause deformed fruit, especially apples. More severe deficiency may be indicated by such foliage and growth symptoms as dieback, withered blossoms, rosettes, deformed leaves, bark disorders, or refusal to grow. Apple trees develop a whorl of small leaves at the end of the shoot. Pear trees form a terminal bud and fail to grow. Another common symptom in pears, is blossom blasting. Some of the flower bearing
Italian prune and sweet cherry show similar symptoms of boron deficiency.

B. Corrective measures—spray with seaweed tea. In acid soil, dig in seaweed or leaf mold. Concentrator plants are vetch, sweet clover and other legumes.

IX. Zinc (Zn) Deficiency occurs in most Pacific Northwest soils

A. Detecting deficiency—rosettes from and the distance between the leaves on the shoots is greatly shortened. In the case of little leaf, the spacing of the leaves can be normal, but the size of the leaf is much smaller than usual. These symptoms can affect all shoots on a tree or just some of them. Yellowing or chlorosis of the leaves is another symptom. On slightly deficient trees, the leaves may be partly yellow but normal in size. On very deficient trees, they will be completely yellow, dwarfed in size, and narrower than normal.

B. Corrective measures—spray with seaweed tea. In acid soil, dig in seaweed or leaf mold. Concentrator plants are corn stalks, vetch, ragweed, poplar and peach leaves.

X. Iron (Fe) Common in alkaline soils

A. Detecting deficiency—leaves are yellow with a fine network of green veins. In severe cases, all the green is gone and dead tissue may develop around the edges and sometimes within the body of the leaf. All parts of the tree may be affected. An application of nitrogen fertilizer may increase the yellow chlorosis. Poorly aerated soil or too much water can cause iron deficiency.
A. Detecting deficiency—copper deficiency, also called "wither tip" occurs in apple and pear trees. The shoots grow normally early in the season, but, in June, the terminal leaves turn yellow, wither and fall. Twigs with dead and withered tips appear over part or most of the tree.

B. Corrective measures—seaweed. Use large amounts in acid soil. The dandelion is a concentrator plant.

XII. Manganese (Mn) Common in alkaline soil

A. Detecting deficiency—yellow leaves. Usually, only older leaves are affected. The veins and the tissues next to the veins stay green. The yellowing is more pronounced as the deficiency becomes more severe. When it is very severe, the young leaves are affected also. Like iron deficiency, manganese deficiency occurs in alkaline soils, but it is not more severe on wet or poorly drained soils. It does not occur as often as iron deficiency.

B. Corrective measures—spray with seaweed tea, especially in alkaline soil. Concentrator plants are: alfalfa, white oak leaves, and tea leaves.

For a more accurate analysis, consult local orchard growers such as Jasper Martin, or send a soil sample to the extension service. Following is a time table of preventative measures for orchards excerpted from "Organic Gardening" magazine, September, 1979 (P. 76a, 76b).

LATE WINTER: Order biological controls for properly timed delivery of beneficial insects. Prune trees while still
dormant. Fertilize with aged manures, compost and rock powders.

EARLY SPRING: Apply dormant oil spray when buds have begun to swell, but before they turn green. Scrape bark on older trees and dust with wood ashes. Apply Tanglefoot or Vaseline to trunks of fruit trees.

BUD BURST: Apply liquid seaweed spray when first green tissue shows to prevent diseases like crab scab. Hang three or four red plastic balls in each apple tree to catch fruit flies. The balls are Tanglefoot-coated.

JUST BEFORE BLOOM: Apply liquid seaweed spray on apples to prevent disease.

AT BLOOM: Thin blossoms that are heavily clustered to prevent biennial bearing. Remove all blossoms from first-year dwarf trees.

PETAL FALL: Apply another seaweed spray for apples to prevent disease. Spray rotenone now and every two weeks until mid-July to eliminate most fruit-damaging insects. Spray diatomaceous earth over trees now and after each rain for next six weeks for soft-bodied insects. If caterpillars are a problem, use Bacillus thuringiensis as needed.

1-4 WEEKS AFTER PETAL FALL: Thin fruit to the proper spacing for each kind of fruit. Foliar seaweed spray can be used for additional nutrition during next year's fruit bud formation. Clean up dropped fruit, now through fall harvest.

MIDSUMMER: Run tiller at shallowest setting under the tree out to drip line to curtail diseases and interrupt insect cycles. Mulch. Remove rusts, cankers or blistered leaves and burn them.

EARLY AUGUST: Perform light summer pruning on espaliered and other types of restricted dwarf trees.
Clean up under trees. Fill mulch into soil out to drip line. Lay down fresh mulch for winter protection.

Paint or wrap trunks for spring sunscald protection. Make wire cages to protect trunks against mouse, vole and rabbit damage over winter. If using poultry manure, apply it now for overwinter decomposition.

For the farm orchard, it is suggested that this plan be applied to tree #'s 24, 26, 33, and 34 if it is applied at all. The purpose of the orchard, in part, is to determine what trees do best without a lot of sprays and care. Thus, the program cited above may be counter to the objective of the orchard. In addition, the use of bug killing sprays of any kind can ruin any chance of creating an orchard ecosystem that is balanced.
EXPLANATION FOR THE SCHEMATIC PLAN

Most of this plan is based on research and input from the 1987 "As You Sow" program however, many suggestions from other farm programs have filtered down, such as the placement of the upper and lower orchards, and people from outside have given good advice too, such as Sam Benowitz of Raintree Nursery.

The criteria for the plan follows.

1. The plan must be diverse in its planting arrangements in order to provide several situations for observation and analysis.

2. It must include a wide variety of fruits and many varieties of each fruit in order to observe and record what does well and what does not do well.

3. The plan should incorporate the possibility of growing annual foodstuffs in combination with the perennial foodstuffs.

4. Disease resistant plants should be planted, especially the new varieties.

5. The plan should allow for experimentation with various organic pest of disease inhibitors. i.e. the possibility that nasturtiums repel coddling moth, and the possible use of chives to prevent scab disease.

6. The cultivating practices should be diverse and beneficial. Such as, growing alders in with the trees to determine whether they are beneficial to fruit trees. They are known to fix nitrogen.

7. Unusual trees of possible value should be grown. One such tree would be the honey locust for experimentation with the pods as fodder or even food for people.
8. The design should be complete as it relates to supporting a community's nutritional needs.

9. It should be relatively low maintenance.

The plan put forth takes into account nearly all of the above. Following, is a tree by tree and section by section explanation of the plan.

Upper and lower orchards: 1, 2, 3 are cherries respectively, "Van", "Stella" and "Sam" on mazzard and/or mahalebier colt rootstocks. No special cultivating practices needed. "Sam" is crack resistant. 4, 6, 8 are plums respectively, "Shiro", "Burbank" and "Italian prune." No special cultivating practices are needed. "Shiro" is the earliest. 5, 7, 23, 24 are apricots all "Jannes". No special cultivating practices are needed. This variety has done very well at the Western Washington Fruit Tree Research Station. 9, 11, 13 are apples, all "Sinta" on malling rootstocks. These apples were selected in order to experiment with chives and garlic as possible deterrents of scab. They are scab prone but mildew resistant. One tree should be left in the normal cultivation rotation while the other two are planted in chives and garlic separately. This apple was recommended by the president of the Skagit Men's Gardening Club for the purpose of testing with chives. Chives are also recommended by some companion planting books as a scab deterrent. 19, 21 are also apples respectively, "Discovery" and "Lodi" on malling rootstock. No special cultivating practices are needed. "Lodi" is very early. 10, 12, 18, 20, 22, 25, 34 are pears respectively, "Orcas", "Seckel," "Comice," "Nijiseiki", "Srirane," "Bartlett" and "Clapp's Favorite" on province rootstock. No special cultivating practices are required. Pears are naturally scab resistant and the should be considered as a commercial crop.
14, 15, 16, 17 are peaches respectively, "Cardinal", "Early Alberta", "Veteran" and "Unnamed Peach". No special cultivating practices are needed. Try to locate "Canadian Wonder" in Canada, or ask Sam Benowitz about it. Pears are tolerant of wet clay-like soil. 26, 27, 28, 31, 32, 33 are apples respectively, "Paulared", "Northern Spy", "Mutser", "Prima", "Akane", and "Chehalis" on semi-dwarf rootstock. No special cultivating practices are needed. All of these apples are either scab or mildew resistant or both. MM106 rootstock (semi-dwarf) is tolerant of wet-clay-like soil. 29, 30 are apples respectively, "Gala" and "Oriole" on MM106 rootstock. These apples should have nasturtiums planted around them in order to experiment as to whether or not they repel codling moth as an orchardist in eastern Washington suggested. They should be compared with all of the other apple trees in the lower orchard. These trees are scab and mildew resistant. 35 is an English walnut tree on black walnut rootstock. Black walnuts are better adapted to wet clay-like soil. 36 is a black walnut tree. 37 is a Japanese heartnut tree. 38 and 46 are mulberry trees. They are placed by other berries in order to deter birds from the berries. They are prolific fruit producers and rare in this area. 39 and 51 are American chestnut trees. 40, 41, 42, 43, 44, 45 are filberts. They need to be rearranged according to the plan. It is not known whether they are wild or domesticated. 47 is a Chinese chestnut. 48 and 49 are honey locusts. They are leguminous trees and have a pod similar to carob which is good for animal fodder or for human food. 50 is a fig. It needs a warm protected place.

Blueberries were donated by the Eberhardt Nursery in Olympia. There are seven different kinds; five plants of each kind. They are marked in the plot. Most of these
blueberries were developed by Elberhardt. They are: Olympia, Big Joe, Washington, Pacific, E-13, M-51-g, 6n-875, developed by U.S.D.A.

Grapes: from North to South are in order of ripening from late to early. Muller-Thurgen, white wine grape, Okanogan Riesling, white wine or dessert grape, Cascade, blue wine grape, Marechal Foch, blue, Leon Millot, blue wine grape, Aurore, white wine grape, Madelaine Angevine, white wine or juice grape, Campbell Early, blue juice grape, Buffalo, blue juice or wine grape, Seneca, white dessert grape, Ontario, white juice or sweet wine grape, Schuyler, blue juice or rose' type wine grape, VanBuren, blue juice grape, Interlaken Seedless, white.

Espalier Apples: are of unknown variety. They need to be fenced and the trees in the nursery row right next to the others need to be transplanted to finish off the row. They are badly eaten by deer and need alot of care. A wire trellis needs to be built.

Alder Hedge: or rather alder trees, should be managed in such a way as to allow small trees to grow while cutting the large ones periodically to keep the shading to a minimum. The purpose of this hedge is to observe whether or not they have beneficial effects on the fruit and nut trees. The benefits derived would be from the nitrogen fixed at their roots. The alder trees may also deter deer from jumping the fence.

Proposed access road to grain fields and barn: a suggested alternative to having a road inside the fenced area to the barn and grain fields. It would make applying manure to the grain fields much easier and, at the same time, keep the fores from creeping toward the garden.
All of the trees were placed and selected in accordance with when they ripen and where the sun is at that particular time or according to the height of the tree as it relates to the sun. For instance, the cherries were placed at the eastern edge of the upper orchard because they are tall and will catch the sun earlier while not appreciably increasing the shading of the other trees. The tree farthest south, "Sam" is the first to ripen in early July. At this time the sun is high and there is very little shade on "Sam". Later on, "Sam" will be shaded and the next one over, "Stella," will enjoy full sun.
Lower Orchard

**Advantages:** ease of maintenance along with less intensive labor. This is because the trees are spaced far enough apart to allow free movement around them and they are allowed to grow more freely. Freer growth means less pruning, wider space allows more air circulation and there is less chance that disease or pests will spread. Interplanting of light sensitive vegetables can be done in summer, and winter gardening can be done in the winter. Very wide spacing could possibly allow small scale grain production, there would be less nutrient competition among trees and less water would be needed.

**Disadvantages:** less fruit per acre, and greater susceptibility to disease and pests due to the monocropping of the apples.

Upper Orchard

**Advantages:** more fruit per acre and less chance of disease spreading because of the interplanting of a variety of fruit. This plan is also more aesthetically appealing.

**Disadvantages:** less air circulation, less light infiltration, will be more labor intensive per tree, there will be less room to work, there will be little chance of interplanting annual crops, there will be more competition for nutrients among the trees, and more water will be needed.
In the past, deer have been the major problem in establishing an orchard. If the orchard were to be planted without adequate precaution against deer, the trees could be killed or severely retarded after one evening of deer feeding. It is for this reason that we recommend that the trees are individually fenced and that the entire orchard is fenced as well. This excludes the blueberries, for reasons already explained, and the mulberry and fig are excluded as they should be able to survive with just the individual fencing. It is not known whether nut trees and grapes are eaten by deer. If not, a lot of fencing could be saved so it would be worth while to check on this.

The fencing around the entire orchard area and garden should be eight feet high. In addition, the gates should be upgraded in order to keep the deer from simply pushing them aside. There should be no gaps, since deer are very persistent during the winter months.

The fencing around the individual trees should be six feet high and in a four foot by four foot square. One side should be made to allow access for weeding and mulching. The fencing must be purchased. Poles from the woods may be used. The source of these are the skinny, dead, standing saplings you see along the path to the campus. The fence is attached to the posts with a staple gun. The gate is simply a fifth piece of wood attached to the end of the fence and tied to the post.

Details about the fencing may be found in the appendix of this paper or on the model north of the plastic greenhouse.
Individual Diagram

Fences

Door Stick

Wire

Post

6'-6.5'

High

Ties

Post

in

1/2

ground
SOURCES OF STOCK

Rain tree Nurseries (Sam Benowitz)
265 Butts Road
Morton, Wa. 98356

Majority of stock will come from Sam.
Minimal chemical spraying.

Below is a list of sources for stock not available from Sam.

'Unnamed' Peach
Frost Nursery
Granite Falls, Wa

'Jannes' Apricot
Buckley Nursery
Buckley, Wa 98321

'Faulured' Apple
Hilltop Nurseries
Etc. 2
Hartford, Michigan 49057

The Skagit Men's Gardening Club
Tomm Perkins
817 Sim's Road
Sedro Wooley, Wa 98284

This group is closely associated with the Western
Washington Fruit Tree Research Station in Mount
Vernon. They sell scion wood of trees adapted to
western Washington in addition to old and unusual
varieties.

If there are any varieties which cannot be located, choose
another variety from the lists in this paper. Remember
to choose according to the picking date and in relation
to the angle of the sun. Refer any question to the North­
western Research and Extension Unit in Mount Vernon, Wa.
They are very helpful.
DISEASE-RESISTANT FRUIT VARIETIES AND SOME NUTRITIONAL PROPERTIES

APPLES: 'Yellow Transparent', scab and possibly mildew resistant, 'Lodi', improved Yellow Transparant, 'Oriole', scab resistant, 'Jonogold', high resistance to scab but susceptible to mildew, 'Akane', scab and mildew resistant, 'Prima', scab resistant, 'Hawkins' Golden October', scab resistant, 'Chehalis', highly scab resistant, 'Hawaii', scab resistant, 'Spartan', fair disease resistance, 'Granbow', one of the oldest scab resistant varieties, 'Idared', patented scab resistant, 'Discovery', scab and possibly mildew resistant, 'Northern Spy', scab resistant and high in vitamin C, 'Fricilla', very resistant to scab but has other problems, 'Paulared', scab resistant but susceptible to mildew, 'Tydeman's Red', scab resistant, 'Grimes Golden', scab resistant, 'York Imperial', scab resistant, 'Baldwin', scab resistant and high in vitamin C, 'Buckley Giant', resists many diseases, 'Prime Gold', (Yellow Delicious type) is rust resistant, 'Macon', fairly resistant to scab and mildew, 'Melrose', somewhat mildew resistant but not resistant to scab, 'Sir Prize', resistant to scab and fungus diseases in humid weather, 'Early Harvest', resistant to scab and fungus diseases in humid weather, 'Red Baron', resistant to scab and fungus diseases in humid weather, 'N.W. Greening', resistant to scab, 'Adanae', resistant to scab and fungus disease in humid weather.

Apples contain a fair amount of vitamins A, B₁, B₂, and C. They produce an alkaline reaction when eaten. The pectin in apples acts as germicidal in the intestinal canal and can be used in the treatment of cancer. Osteomyelitis, an

* Any fruit which is not commented upon may not have any special resistance, but it is grown here.
affliction of the bone marrow, also responds to pectin.
The uronic acid contained in the apple is also of particular
use in treating intestinal problems since its aroma stim-
ul...ates digestion.

PEARS: 'D'anjou', moderately susceptible to blight but this
is not a problem in the Pacific Northwest, 'Aurora',
'Bennett', disease resistant, 'Bartlett', 'Siriine',
'Comice', 'Highland', 'Eldorado', 'Shinseiki', Japanese
variety, 'Clapps Favorite', resistant to fire blight and
hardy, 'Nyiseiki', Japanese variety, 'Lincoln', resistant to
fire blight and hardy, 'Chojuro', Japanese variety, 'Starks
Delicious', resistant to fire blight and hardy, 'Kieffer',
resistant to fire blight and hardy, '20th Century', Japanese
variety, 'Bosc', highly susceptible to fire blight, 'Flemish
Beauty', 'Seckel', fairly resistant to fire blight, 'Orcas',
highly scab resistant, 'Max-red Bartlett', 'Moonglow', highly
resistant to fire blight, 'Winter Bartlett', somewhat
susceptible to fire blight.
The pear belongs to the same family as the apple, and
possess very similar therapeutic and nutritive values.
Its average calcium and phosphorous content is slightly
higher than the apple, but it contains less vitamin A.
It is richer in vitamin B2, and has about the same amounts
of B1 and C. Pears are rich in natural sugar, and they
contain sodium, iron and other minerals which produce an
alkaline reaction.

CHERRIES: 'Compact Stella', a genetic dwarf produced by
radiation at the B.C. Sumerland Research Station—highly
recommended, 'Early Burlot', 'Morean', 'Smo', crack resistant.
Pears are naturally resistant to scab—they can also tolerate
long wet periods and heavy clay soils. Good for PNW.

*Cherries are problematic in Western Washington
Apricots are the richest in vitamin A of all fruits-4000 international units per 100 grams, and they contain a little of vitamins B1, B2 and C. Apricots are rich in alkaline minerals, and are laxative when taken in large quantity. Apricots have an excellent influence on the intestinal tract and blood. Apricot kernels are good to eat and complete the nutritive value of the fruit.


Grapes: the list of grapes suitable for western Washington can be found in the EXPLANATION FOR THE SCHEMATIC PLAN. Grapes have cleansing properties which enables the system to throw off toxins and rebuild the blood cells. They produce an alkaline reaction and help normalize acid conditions. Grapes contain certain enzymes which help to improve gastric and intestinal functions. Tea made from grape leaves provides relief from chronic constipation.
the fruit and the juice are quickly assimilated.

Grapes are rich in iron, and contain vitamins A, B<sub>2</sub> and C in small amounts. The juice has been termed, "a kind of vegetable milk, the composition of which has the greatest analogy to human milk."

BLUEBERRIES: see the section ESTABLISHING FRUIT AND NUT TREES AND MAINTAINING THE SOIL.

**HAZELNUTS AND FilBERTS**: 'Barcelona', 'Duchilly', 'Royal', 'White Aveline', a light crop used as pollinizer, 'Daviana', a light crop used as pollinizer. Hazelnuts yield 670 calories per 100 grams. They are rich in vitamin A and B<sub>1</sub> and B<sub>2</sub>. They are high in calcium, magnesium and iron, and produce an alkaline reaction. A certain variety is known as the 'filbert' while another, broader and shorter than the filbert is known as the 'cobnut'. The latter has a high water content and appears to contain some vitamin C and B<sub>1</sub>. Hazelnuts contain less (incomplete) protein than most nuts, but are richer in fat, 60%. Since the skin is indigestible, they should be peeled.

**CHESTNUTS**: 'American', a fungus is killing nearly all of these, 'Chinese', 'Spanish', resistant to oak root fungus, 'Buckeye', 'Ohio', and 'Sweet' - related to chestnuts - cattle will eat 'Sweet' and 'Buckeye' and paste made from them was once used by bookbinders - not edible.

**WALNUTS**: 'Butternut', 'California Black', resistant to oak roooy fungus and drought resistant, 'Black', fairly drought tolerant - do not plant near vegetables or flower gardens as it inhibits the growth of these plants. Improved varieties with thinner shells are 'Thomas', 'Stabler', and 'Ohio'.

'Franquette', 'Idaho', and 'Mayette' are suitable here.

Filberts do well here. The Willamette Valley in Oregon is the major filbert producing area in the U.S.
"HONEYLOCUSTS": 'Imperial', more densely foliaged than most, 'Moraine', 'Rubyface', 'Slade Master', 'Skyline', 'Sunburst', 'Japanese'.

FIGS: 'Kadota', resistant to oak root fungus, 'Mission', resistant to oak root fungus, 'Black Spanish'.

GINGKO: an edible nut. They are resistant to oak root fungus. The females produce a fruit that is yellow and ill-smelling. Inside the pulp are two angled creamy white nuts which contain an edible kernel.
BIBLIOGRAPHY


An excellent book for good basic design ideas for home and community building.

Alway, F.J., Kitteredge, J., and W.J. Methley. 1933. Components of the forest floor layers under different forest trees on the same soil type. Soil Science. 36:387-398


A really good article on esthetically pleasing, productive landscapes; also has basic principles of permanent agriculture and is well referenced.

Baynton, D. and O.C. Compton. 1945. Leaf analysis in estimating the potassium, magnesium, and nitrogen needs of fruit trees. Soil Sciences. 59: 339-351


Good for determining good materials for compost pile.


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An excellent, creative, unusual book of little known food plants and receipes for them.

Burke, E. and H.E. Morris. 1933. Nutrient elements used by leaves and growth of apple trees. Plant Physiology. 8: 537-544

Articles on desertification, land reclamation, skidding, and an article by E.F. Schumacher.

An excellent reference source for gardening of all types in western and eastern Washington. It has lists of fruits, nuts and other useful trees with pertinent information about them.

Good summary of the carbon dispute.


Good basic information for gardens and orchards.

Lots of good information on requirements for growing grapes.


Very helpful for identifying nutrient disorders. Has pictures and written descriptions.

Chemically oriented.


Crops are ecosystems too. 1978. Mosaic. 9:24-31
A good summary of integrated pest management in several states; includes apple orchards in eastern Washington.


Not totally organic. Very good for planning a large agri-silviculture design.

Highly recommended by Barbara and Ken Kern, authors of THE OWNER BUILT HOMESTEAD; excellent old knowledge.

Provides a perspective for creative, ecologically sound patterns of living.


Excellent information for the organic fruit grower. Old knowledge.

An excellent old book with a lot of practical information on producing the most from orchard land; it refers to many old practices of fruit production.

Discusses experiments done in Israel and North Africa on the potential of deserts to produce food with only the normal rainfall. Reconstruction of ancient farms to determine how people were able to survive with 1-6 inches of rain a year.


Gives a valuable perspective on desertification and efforts to stop its progress. Refers to Evanaris’ experiments

An excellent reference of native foods eaten by Indians here.


This is a catalog. It has excellent cross-pollination charts and picking date charts for many tree fruits.


Totally chemical

International Association for Education, Development and Distribution of Lesser Known Food Plants and Trees.
Good and Wild, Lynwood, Ca. 2:1, 23 pp., 2:2, 31 pp., 2:3, 31 pp., 2:4, 31 pp., special issue 1
An organization applying many food producing techniques on the Baja California desert.

Excellent reference for spacing, liming, growth time, and varieties of/or fruits, nuts and vegetables

Has really good suggestions for intensive small-scale fruit production

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Stratton, Michele. 1979. Pulling the plug on Arizona. Mother Jones. 7:16-21
A good article on the potential problems of depleting fossil waters from the ground.

A concise book on composting, earthworms, sprouting, container food growing, homesteads, herbs, vegetables, fruits, nuts, food storage and nutritional basics.


Intermediate technology applicable in any windy area.

Speaks to the effects of chemical agriculture on the soil and the potential of organic practices.

Good reference for dwarf root stock, propagation, establishing and maintaining dwarf trees. Recommended by the Washington Tree Research Fruit Tree Research Station and Sam Benowitz.
I. Weather Bureau, 1968. Climatological handbook Columbia basin states precipitation. V. 1 parts A and B, V. 2, V. 3, parts A and B.


Basic principles of soils. Not as good as Brady's book, but shorter and helpful


Valuable information for amounts and mixtures of compost

Discusses new water conservation practices


ADDENDUM

Provides an historical perspective on the care/destruction of land. Includes notes on wars and deforestation


"Tilth" is published by the people of Pragtree Farm, Arlington, Washington. They are in the process of planting large areas in orchards. Their perspectives on orchard management are extremely valuable.


Dear Joel and Fred:

We have written some comments on pages of your report. Could you return those pages back to us so we can have a complete report. Unfortunately I don't have the time to thoroughly check out the report now. It is evident that Joel has put many, many hours into it and that it will be very useful.

To lousing are some random thoughts. I don't have any comprehensive suggestions about how would be best to proceed on an orchard plan. I guess that depends on what your goals are and what your limitations are.

Is your goal is to plant a variety of trees so students can experience taking care of a diversity of plants? It seems you have done well in this. It seems like the goal of having a model of how small landholders can develop a diversified farm, orchard and garden is fairly well met.

Towards this goal people like Woody Dercky could steer you to research actual small farms existing in Europe which are successfully farming in an ecologically interdependent and diversified crop rotation fashion.

The goal that is not being met very well in the plan is the goal of setting up good experiments for getting data on variety differences, insect, fungus, weed, nutritional and other differences.

What should the Evergreen Farm's role be in providing useful research for organic grovers in Western Washington? In the area of orcharding the answer is probably that nobody yet knows very well.

There is beginning a resurgence of interest in organic orcharding in this area. The practicing orchardists haven't even had time to come up with the questions they need researched.

Is that small field area the only area which is likely to be available to "organic types" for orchard or permaculture research in the future.

If more land is likely to be available for future research it seems it a good idea to proceed with your plant for development on an integrated small farm.

If no more area will be available then the question arises. Is the area available even suited or is there enough space for a variety of experimental plots? Maybe there is not enough room to have a working model of a diversified small farm and have room for scientific blocks.

I don't mean to say that no scientific experimentation be done in your current plans.

No ever by using all or almost all of the available space now you may be closing the door to possible useful future experiments.

A lot of your information on which you are basing what to put where is incomplete. We have pointed out a lot of errors. You have missed a lot of errors. Also we probably have made a lot of errors in evaluating your errors.

If possible I suggest you go around to all the existing practicing organic fruit growers you can find and ask what we should be able to help them through orchard setting up and testing.

I then suggest that you use their knowledge and future interests to modify your report. Then I suggest you check with the Doubleday research foundation in England; maybe, the Organic Gardening... research people at any other institutions which may have set up similar permaculture experiments in ways they did.

You have found out what the disease problems are and what to do in the report. However you don't know at all practically which of these potential problems is really a problem in our area. Also using nels to build and mildew as an example you selected varieties because they are resistant to mildew even though they are not the best adapted to scale well passing over varieties which really don't have serious disease with either host years and under most conditions because they are not as hardy, particular resistant.
I think a careful reading of the research and looking at trees regularly at St. Vernon would help. Not in your own files of info.
I find those people Jacky King, Gary Noulton and Bob Horton are very helpful though very busy. I would like to talk with them until I join up there and reading all their relevant research. They have data on scale and mildew for each variety, bloom times, fruiting dates. If it is also very useful to know the growth habits of each variety for recommendations of future pruning and care and also for initial spacing.

Now for some specific data that I would like to know and experiments that I would like to visit to learn more myself.

1. Which varieties of apples or other fruits have a natural resistance or repelling effect on which insects. Here is initial research being started at Purdue or Indiana. AMI Research Foundation would know about it.

2. I would like to see the most disease resistant varieties of fruit trees growing and fruiting in Olympia including the AMI "Coop" introductions and the named Geneva New York Ex. Station introductions to see how they do in Olympia.

3. I would like to see how small blocks of trees reacted to "organic" manure dist under several types of stalled and trellised intensive situations. on dwarfing rootstocks.

4. I would like to see S.W. Washington scouted for the best "wild" fruit trees. Promising selections should be used on dwarfing rootstocks (both to induce early fruiting and to see the tree on a dwarfing rootstock.

5. I would like it known publicly that Evergreen was encouraging old timers and young timers to send you promising selections. These varieties should be regularly monitored on many different criterion to evaluate their value in terms of course disease and possible insect resistance.

6. I would like to see in practice in an organic orchard how summer pruning and other mechanical factors can cut down on insect or disease problems.

7. I would like a chemical nutritional analysis done on each of the newer fruit varieties. This nutritional information should be one of the most important criteria in deciding which fruit is best for our region.

8. What is the effect of various cultural practices on the actual nutritional value of fruit?

9. How many pancakes does it take to cover a dog house?

10. If the other people in our region come up with as many possible criterion for setting up an organic orchard plan, how the hell will we be able to get started within the next 100 years?

11. I suggest Mike Haki, Tom Thornton, Brian Saunders, Michael Nolan, Jack Prevorse, Brian Mugle and Steve Talbott as people to show your plan to and as well other people to show it to.

12. I don't think you need to get all those trees planted this season. I liked the idea of setting up an experiment on 3 different rootstocks to see the effects that eludes would have grown the trees. Maybe these may turn comments about that.

13. May plant some now and some later. If you want the trees this year reserve the ones you want as soon as possible. In that I will expect them in planting at the rate of 3 hours per tree. You have already cut off five trees. Michael Nolan is handling the nut trees as well as he says he would be open to a similar trade.

Both Michael and I will be in town the selling season on 35 acres. Starting in February, we will be doing rating. If a student wants to work to talk and work they should phone ahead and would be welcome.

I hope I haven't been discouraging or boring. I feel like I don't know very much about the subject either. As we experiment our know. I regret that I don't make enough time for myself to experiment. I'll see the good research. You've got a good starting list. Your work on a blueprint that it will take 20-25 years to get out of the bugs out.
BEAN

Horseradish Horticultural: Seeds from Abundant Life
  Good production, large beans
Lousiana Purple Pod: A.L.
  Good production, tasty, tender beans
Royalty Purple Pod: A.L.
  Good production. Planted late, not vigorous growth, but good yield.

BEANS—LIMA

  Planted in greenhouse; flowered, but didn’t produce.

Blue Lake: Western Farmers; Fertilized deep, produced well; good quality.
  Late fall crop was ruined by mold
Tender Crop: Planted at Harmony farm; excellent results
Teddy Bear; A.L.: Planted May 18; well drained soil; good yield.
  Late planting, good yield, but molded in fall.
  Nod late in season

BEANS, NAVY

Lance: A.L.: Poor germination, didn’t produce well.

BEAN, LIMES

 Proc A.L.: low yield, ruined by mold before the beans ripened.

BEAN, POOD: Express
  Produced dry beans in the greenhouse, but not outside. Plants small,
  weather prevented good results.

BEANS, FAVA

Windsor, vegetable fava; A.L. Excellent yield. Overhead watering knocked
  plants over. Early spring plantings produced well.
Hill Fava, seeds from Woody Garvatz; good yield. Should be planted
  late fall, winter hardy and blossom early in May.

BEANS, L: Y

Fiskby V: ENTSOY, Univ. Illinois: Matured early, good production
Maple Presto: ENTSOY: Matured, poor production
Maple Arrow: ENTSOY Good growth, but never reached full maturity.

BEETS:

Detroit Dark Red; A.L. produced well
Lutz Green Leaf: A.L. produced well; good greens, large roots
Early Wonder: A.L. produced well

BROCCOLI

Italian Sprouting: planted April 3, excellent yield
Early Purple Sprouting: A.L. Spring planting didn’t yield until the
  following March. Should be planted in fall for spring production.
  Fall planting: prolific, small, tasty heads, winter hardy.

BRUSSELS SPROUTS

Tatsoi: A.L. didn’t yield very well; froze in winter.
Danish H.L. transplanted well, slower to produce (?)

CABBAGE:

problem of over watering caused heads to burst.
Chiefly Savoy: A.L.: good yield
Golden Acre: good yield
Mammoth Red Rock: late maturing, regrew small heads after main head harvested.
New Jersey Wakefield: Early season, good yield.

CABBAGE, CHINESE:

all from Abundant Life

Bak Choy: heavy attack by root fly maggot and slugs. Yielded well in
  early spring and fall, cool weather.
Japanese White Celery: similar to above

Bak Choy: similar to above
1980 vegetable varieties continued

**CARROTS** - early plantings avoided root fly damage
- Danvers 126: A.L.
  - Interplanted with lettuce, grew ok but were small
- Amsterdam forcing: A.L.
  - Small yield, rust fly maggot problems
- Scarlet Nantes: A.L.
  - Small carrots, low yield, rust fly maggot problems

**Cauliflower**
- Early Snowball: A.L.
  - Did well, small to medium heads, Late season discoloration on heads
- St. Valentines: A.L.
  - Grew well, hardy crop yielded nice heads

**CHARD**
- Thurbarb Red: A.L.
  - Grew very well, good quality producer
- Lucullus: A.L.
  - Grew well, fine producer

**CORN Salad**
- Variety unknown from A.L. grew well throughout the year.

**CORN**
- Black Aztec: A.L.
  - Flint corn did well interplanted with bush beans
- Golden Jubilee: W.F. treated with captan
  - Grew well, some seed eaten by birds, matured late in season
- Morning Sun: W.F. treated with captan
  - Grew well, some seed eaten by birds, matured late in season

**CUCUMBER**
- Early Russian: A.L.
  - Medium producer, nice long fruit
- Lemon: A.L.
  - Did well, tasty fruit
- Early Ochiat: A.L.
  - Grew fairly well but had poor germination rate
- Puget Pickler: A.L.
  - Lat planting, produced small fruit

**ECCOPLANT**
- Japanese Early Purple: A.L.
  - Flea beetle and virus damage (grown in greenhouse) produced small fruit

**LETTUCE**
- Edible: A.L.
  - Excellent growth, yielded late into fall, winter killed.
- Ornemental: A.L.
  - Grew very well and produced beautiful head
- Siberian: A.L.
  - Grew all summer and winter, produced prolifically
- Tall Green curled Scotch: A.L.
  - Grew very well, produced prolifically

**KOHlrABI**
- Early Purple Vienna: A.L.
  - Produced well
- Early White Vienna: A.L.
  - Produced well into winter

**KALE**
- Ornamental: A.L.
  - Grew very well and produced beautiful head
- Siberian: A.L.
  - Grew all summer and winter, produced prolifically
- Tall Green curled Scotch: A.L.
  - Grew very well, produced prolifically
LETTUCE: April plantings did best, all varieties did well
Butter Crunch: A.L. Overwintered well
Oak Leaf: A.L.
Black Seeded Simpson: A.L.
Great Lakes Premier: A.L.
Iceberg: A.L. didn't germinate
Romaine:
Salad Trim Red: Not good appearance for marketing; overwintered well.
Winter Marvel: Fall planting overwintered well
Romaine: Did great

Mustard: (see Chinese Cabbage)

HELLEBORES
Early Hanover muskmelon: A.L. Grown in plastic greenhouse, some yield, killed by mildew in the fall.
Northern Sweet Watermelon: A.L. Grown in greenhouse, one small fruit.

OKRA:
Green Long Pod: Burpee: poor germination, didn't yield (grown in greenhouse)

ONIONS
Green Bunching: from seed: planted April 4, grew well.
Walla Walla Sweet, sets: Western Farmer: Fair (interplanted in shade)
Yellow Globe: planted late, didn't mature

GARLIC
Elephant Garlic: Planted fall '79, grew well, didn't remove flower heads, which caused small garlics.
White garlic; grown at the Organic Farm several years, source and variety not known, excellent yield.
Red tinted garlic: same as above

LEEKs:
Planted in February: A.L., Carentain: ":", planted in trenches, did well

PARSLEY
French type: grew well all summer, fall and winter, into spring
Nobby curled: grew well
PARSNIP
Didn't germinate

SALSIFY: Grew well, but dug up by mistake before harvesting in early spring.

PEAS
Alaska Early: A.L., Saved Seed from previous years. Planted in early March, grew very well, good yield.
Sugar Snap: Grew well, very tall, good yield
Oregon Sugar Pod: Didn't do very well: late variety, virus resistant.
Dwarf Gray Sugar: Fairly good yield, wasn't very tasty
Lincoln: shell pea, did quite well
Laxton progers: planted late, virus resistant, Didn't grow well.
Chinese Snow Peas: Early planting, did very well.

PEPPERS:
Produced in greenhouse, not outside. All from A.K.
Cayenne: Aphid problems, poor germination, good production eventually
Red Marconi: A.L. produced fairly well
Kins: did well
Cal Wonder: did quite well
Sweet Bull Nose: grew and produced quite well

POTATOES: attacked by flea beetles: early plantings outgrew them, late had more damage
Norland, Early Red: Western farmers certified: did fairly well

PUMPKINS
Streaker: Naked seeded: Nichols: very poor germination; poor yield
Jack-O-Lantern: Saved seeds: fair yield
Small Sugar: A.L.; excellent production
BAKED

Daiikon: A.L.
- Good growth but mostly attacked by root maggots
Cherry Bell: A.L.
- Best crop form early planting

BUTTERCUP

Laurentian: A.L.
- Good producer, late season growth

SPINACH

Bloomdale Latties: A.L.
- Good crop, plant early to prevent bolting
Cray: A.L.
- Grew well but not maintained
Winter Bloomdale: A.L.
- Grew well, winter variety

THICK LEAF: A.L.
- Fine winter variety

SQUASH

Summertime:
- Scallop: Nichols
- Scallopini: Nichols
- Both varieties grew and produced well
Yellow Crook Neck
Yellow Straight Neck: A.L.
- Neither grew very well and suffered from mold damage
Zucchini: Dark Green: A.L.
- Poor germination but produced fair winter

Butternut Waltham: A.L.
- Very early

Roman Acorn: All from A.L.
- None of these varieties did particularly well

SOY BEANS—see beans

Swiss CHARD—see chard

TOMATOES

Italian Plum: A.L.
- All early plantings suffered from flea beetle damage
- Fairly late producer, tough, resistant fruit, heavy yields and slow to mature
Nova: A.L.
- Plum type, early producer, medium yield and fruit susceptible to rot
Red Cherry: A.L.
- Outdoor crop, only fair production, better growth in greenhouse
Ponderosa: A.L.
- Medium size, good producer, late maturity
Willamette: A.L.
- Medium size and production
Sweet 1000: A.L.
- Very good producers, huge plants
- Unknowns and volunteers grew the best and produced the most

TURNIPS

Purple Top White Globe: A.L.
- Early crop did quite well
Shogoin: A.L.
- Planted late did poorly