Orchard Management Practices and Handbook

A Senior Project

presented to

the Faculty of the Agriculture Science

California Polytechnic State University, San Luis Obispo

In Partial Fulfillment

of the Requirements for the Degree

Bachelor of Science

by

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Chapter One

Introduction

Many California high schools with agriculture programs have school farms. However, farms vary depending on the focuses of the chapter and the communities. Some school farms have orchards while others have more livestock based farms. These school farms are used to teach students how to handle livestock, grow crops, and manage Supervised Agriculture Experiences among many other techniques and skills. San Benito County is focused on orchards as well as livestock production (Commissioner’s Report 2013). The school farm for the Hollister FFA Program includes both an orchard as well as an area for livestock focuses. The school farm is mainly utilized for livestock projects leaving the orchard untouched. The focus of the project is to expand the chapter’s SAE’s, to not only include livestock, but orchard management and production as well.

Statement of the Problem

The orchard at the San Benito High School Agriculture Department has been unoccupied by students and instructional purposes for several years. The department faces potential loss of property in the future due to the land not being used by the students or used for educational instruction. With the current budget crisis facing San Benito High School, the land may end up in the hands of another department, such as athletics. The agriculture department borders the athletic facilities and the possibility of the orchard becoming a part of the athletics facilities as the space continues to be unused.
The Importance of the Project

Students will have the opportunity for hands on learning and will have the opportunity to use the orchard as a Supervised Agriculture Experience [SAE] project. By implementing the orchard back into the San Benito High School Agriculture Department and curriculum, the department is guaranteed to maintain ownership of the land and its contents.

Purpose(s) of the Project

Creating guidelines and resources to the San Benito High School Agriculture Department, students will benefit by hands-on-learning experiences. Engaging students with the orchard will allow students the opportunity to educate themselves, create an SAE on the school farm, and manage the orchard to its full potential.

Objectives of the Project

The objective is to develop an outline for student SAE projects in orchard management and fruit tree production. The orchard SAE is an ideal project for students without room for a project at their own home. The project will also facilitate a good startup for students because the agriculture department provides the land, equipment, and trees.

Definition of Important Terms

American Degree: The highest obtainable degree within the FFA Organization.

Chapter Degree: A degree received by any second year student enrolled in an agriculture course who fulfills the degree requirements.
FFA: A national organization that develops student potential for premier leadership, personal growth, and career success through agriculture education.

Greenhand Degree: A degree received by any first year students enrolled in an agriculture course; to receive higher degrees one must obtain the Greenhand Degree first.

Proficiency Awards: Awards that honor FFA members who develop specialized skills that can promote future career development.

Supervised Agriculture Experience: One of the three components to the agriculture education model; students develop learn by doing experience.

State Degree: A degree received by any student who is a third or fourth year student enrolled in an agriculture course who fulfills the degree requirements.

(All Definitions were pulled from the National FFA Organization)

Watersprouts: Vegetative growth that is one year old and non-fruit bearing

Hangers: Branches growing in a somewhat U-shape towards the ground. Usually very prone to breaking due to the weight of any fruit produced upon them.

Cross-overs: Any branches that are growing across each other, usually forming an X pattern. Most often only one need be removed.

Suckers: Vegetative growth from the base of the tree. Similar to watersprouts.
Summary

The problem that is faced for the agriculture department is the underutilization of the orchard at the San Benito High School agriculture farm. The problem faced with the orchard being unused by the agriculture department for several years is the possibility of losing the land to another department such as athletics. If the students do not use the orchard for either a SAE project or for agriculture instruction outside the classroom it could soon be lost. The plan is to create an orchard and fruit tree production SAE outline for students.

This outline could serve as a possible SAE project for students who may not be able to pursue more costly projects such as livestock. The school provides the necessary resources for the success for this project. The creation of an outline for these possible SAE projects will allow the space to be utilized by the agriculture department, therefore allowing the program to maintain ownership of the land and encourage students’ development within orchard management and production.
Chapter Two

Literature Review

The intent of this project is to develop guidelines for a SAE. Students unable to participate in livestock projects for the San Benito County Fair, located at the Bolado Park fairgrounds in Tres Pinos, will be able to utilize this opportunity. Whether it is due to financial need or not having adequate space to support a project of that type, students will have the opportunity to have an SAE project located at the Hollister FFA’s school farm (See Figure 2-1).

*Plaque Dedicating the Orchard*

*Figure 2-1*

This project could include fruit production, orchard management, or diversified crop production. Students will be able to manage the orchard and profit from sales of the harvest at local farmers markets and county fair exhibits. Students will also be able to meet the
requirements for such programs as the State FFA Degree and American FFA Degree, as well as several proficiency areas in fruit production, agriculture sales, and agriculture processing.

**Local Background on Community and Agricultural Production**

Hollister is very agriculturally based. According to the latest San Benito County Crop Report, the major agriculture commodities found in this area are: cattle, forage crops, vegetable crops, walnuts, apples, apricots, cherries, wine grapes, and olives. San Benito High School is the only high school in Hollister, and provides instruction to nearly 3,000 students. The community is highly involved in the high school’s agriculture program – Hollister Future Farmers of America [FFA]. Within the Hollister FFA program, there are 322 members (CalAgEd r2 report 2014.)

**Orchard Management**

Orchard management is crucial for an orchard to grow in a successful manner. The first of these management areas includes proper irrigation. Proper pruning techniques, correct harvest times, and successful marketing for sales follow. All of these aspects will aid to ensure a profit from the project, making it economically feasible along with allowing students to meet the requirements for the various degrees and awards available to them. The types of fruit and nut crops successful in this area, according to the San Benito County Ag Commissioners office, are: Apples, apricots, cherries, grapes, olives, and walnuts (2013). The total amount of revenue brought through these crops totaled $41,190,000 in 2013 (Commissioner’s Report 2013).
Irrigation

Depending upon the variety of fruit and/or nut tree the irrigation requirements will differ. One will need to perform their own research on how to properly irrigate each variety maintained. Proper irrigation will ensure a successful crop come harvest season. Irrigation is crucial for both vegetative growth as well as fruit production. “Irrigation of fruit trees … serves … to increase and stabilize production. In addition, it has been shown that proper irrigation practices can have a positive influence on the quality of the harvested produce and any resulting processed product” (Evans & Fereres 1 2005.)

Pruning

Pruning is equally important in regards to tree health and successful fruit production. Pruning the trees in order to create the proper shape will improve the quality of the fruit due to an increased amount of sun. “The growth and form of trees from the time of seed germination to maturity is directly affected by light intensity, quality and duration” (Zimmerman & Brown, 1974.) The shape created from pruning will depend upon the fruit tree. They include: Modified central leader, central leader, and open center. These are all possible ways to shape a fruit tree. Each pruning method is tailored to different fruit tree varieties. (See Figure 2-2)
Figure 2-2

Pruning methods will need to be researched by the students in order for them to determine the best method for the fruit trees that they are maintaining.

Harvest

Harvest times for each variety will vary and the USDA standards must be met for fruit to meet marketing standards. As well as different seasons of harvest, different varieties of trees may utilize their own way of harvesting. However, with there only being a total of 65 trees of multiple species and varieties within the orchard there is no need or monetary capability of the department to use mechanical harvesters. The students will therefore need to harvest the fruit by hand. (See Figure 2-3) Requirements for all fruit standards in regards to quality of fruit for sale can be found at the USDA website.
The Hollister FFA program’s orchard

Sales

There are a variety of aspects when it comes to selling the product. Students must acknowledge the “four P’s” of marketing according to Higgins - Place, Price, Promotion, and Product (Higgins 2014). Place indicates where the product will be sold. Small businesses like so have a variety of opportunities for the sales of their products. Opportunities such as local farmers markets, private distributors, and even local restaurants, are a good place to start for success in sales. The second P is Price; this dictates the amount charged for the product. Price is an important factor in being financially feasible. If the price is too high the product will not sell, and if it is too low there will not be enough income to afford the upkeep of the project. Promotion is the aspect of marketing the product to the community. Successful marketing of the product will increase sales. Lastly the product will need to be decided upon whether or not it is sold as fresh fruit, dried fruit, preservatives, or all the above. This decision can highly affect the two P’s of Price and Promotion, due to a variability of input costs and the demographic of the target market for the product. Advertisement through the community and social media could be beneficial for acknowledgement of products.
Proficiency Areas

Proficiency awards honor FFA members who have well-developed skills they can apply towards their future careers. Students compete on a local, state, and national levels. Students can compete in 49 areas including placement and entrepreneurship. Students are to fill out the proficiency application found on the National FFA website, go through an interviewing process explaining what they have learned through their project, and continue on to the higher levels of competition. Proficiency areas students can compete in using the orchard SAE include: Agricultural Processing- Entrepreneurship/Placement, Diversified Crop Production-Entrepreneurship, and Fruit Production- Entrepreneurship/Placement (National FFA Organization).

Students can compete in Agriculture Processing- Entrepreneurship/Placement award area if the student owns or works for a business assembling, transporting, processing, fabricating, mixing, packaging and storing food and nonfood products. Programs could include processing dried fruit, and processed foods such as jams (National FFA Organization).

Students competing in Diversified Crop Production Entrepreneurship either work or owns an enterprise or business applying the best management practices available to efficiently produce and market crops from two or more of the crop related proficiency areas. This includes specialty crop production and fruit production (National FFA Organization).

In the area of Fruit Production- Entrepreneurship/Placement, students own or work for a business including best management practices available to efficiently produce and market crops for fruits such as stone fruits, pome fruits, citrus fruits, pineapples, coconuts, berries, cranberries, watermelon, grapes, nuts, and all common fruits. Pome fruits include: apples, mayhaws and
pears. Stone fruits include: peaches, nectarines, plums, apricots, and cherries (National FFA Organization).

**FFA Degrees**

Each Degree has a list of requirements which must be met in order for the FFA member to receive it. The Greenhand and Chapter Degrees are both at the discretion of the Chapter Advisor to determine if students meet the qualifications seeing as the Advisor oversees the activities that meet the requirements. The State Degree is given by the California FFA Association after the students’ record books have been reviewed. If they meet the SAE and other requirements such as community service and participation of activities within the organization then they will receive their State Degree. In regards to the American Degree the National FFA Organization reviews the applications of students wishing to receive the Degree to determine if the requirements have been met (National FFA Organization).

To receive the Greenhand Degree you must have satisfactory plans for an SAE project. You must also have a good understanding of the FFA and all of its aspects, including the jacket, manual, and motto. Along with being enrolled in an agricultural education program according The National FFA Organization (National FFA Organization).

The Chapter Degree does include SAE requirements however. Students must not only have an approved SAE, but also invested 150 dollars or have worked at least 45 hours outside of the classroom towards their SAE according to The National FFA Organization. As well as this the student must have a plan to continue the growth of their SAE (National FFA Organization).
To receive the State FFA Degree in California students must have at least earned and productively invested 1000 dollars or have worked at least 500 hours outside of the classroom on their SAE project (National FFA Organization).

The new SAE requirements for the American Degree effective as of January 1, 2015 are that a student must earn at least 10,000 dollars and productively invest 7,500 dollars. However, if these requirements are not met there is a second set that may qualify the student. They are that a student must have earned and productively invested at least 2,000 dollars and worked 2,250 unpaid hours in excess of scheduled class time; Any combination of hours, times a factor of 3.56 plus actual dollars earned and productively invested must be equal to or greater than the number 10,000. Hours used for the purpose of producing earnings reported as productively invested income shall not be duplicated as hours of credit to meet the minimum requirements for the degree (National FFA Organization).

Summary

The topics of irrigation, sales, pruning, and harvesting are important factors in managing an orchard. If each area is properly maintained students can achieve multiple degrees and proficiencies within the National FFA Organization. With students achieving success within the FFA circle of the program Hollister FFA will be a much more fully rounded chapter.
Chapter Three

Methods and Materials

As Hollister FFA Alumni, authors are providing students within the Hollister FFA Chapter a guide to developing their own SAE project in terms of orchard and fruit tree management. It will provide an opportunity currently not offered in the agriculture program. This will allow for expansion and utilization of the facilities as a whole.

Determining to create an SAE

SAE’s are an integral part of the three-ring philosophy of agricultural education (See Figure 4). Classroom instruction and FFA Leadership are equally as important to an FFA chapter. The Hollister FFA chapter is well rounded in these two areas of the three-ring circle. With both authors having graduated from the program they are well versed with the overall success within the Classroom and FFA circles. Each of these two circles within the chapter are quite diversified. The third circle of SAE is not as diverse, as well as there being a lower involvement of students within the circle. All SAE projects are livestock based whether they be production or market animals. They do cover most species including beef, swine, lambs, and goats. Crops of any kind, however, are not a project covered by students within the chapter. This is why the circle of SAE was chosen to expand upon, including the already available orchard to facilitate the project.
Determining Requirements

In order for students to determine what they will need to accomplish in order to have a successful SAE, the authors looked to both the California Future Farmers of America and to the National FFA Organization guidelines. Upon looking at the requirements for various degrees, aforementioned in earlier chapters along with proficiencies it was decided that orchard management should be the focus of the outline. With successful orchard management all other criteria will fall easily into place for students seeking a degree or proficiency.

Guide Content

The guide will outline the requirements for having a productive SAE. It will have descriptions of each important aspect as well as directions for researching the topics further.
Along with graphic examples to clarify the steps for students. Students should be able to follow
the basic outline and develop an SAE that utilizes the Hollister FFA orchard.

**Formatting**

The guide can simply be printed out as a section of this document. It will be in a simple
format to make for easy reading. With the simple outline and several references to allow students
to further research orchard management practices, the students should be able to achieve a
fruitful SAE. The outline will be as follows:

1. Orchard Management Introduction
2. Pruning
   a. Central Leader
   b. Modified Central Leader
   c. Open Center
   d. Which trees use what pruning method
   e. Tools
   f. How and when to prune
3. Irrigation
   a. Reasons
      i. Fruit size
      ii. Production
      iii. Sugar content
   b. Types
i. Micro-sprinkles  
ii. Drip  

4. Harvesting  
   a. By hand  
   b. Mechanical  

5. Sales  
   a. Local farmers market  
   b. Local stores  

Each section of the guide will have basic instructions in each of these areas to help students start their SAE projects. Along with these basic instructions there will be references for students to utilize if they wish to further their knowledge of orchards beyond that of a basic level. Keeping in mind the guide is a simple start to an SAE not an exact step by step instruction. This will help to encourage students’ desires to learn more on the subject.  

**Choosing a Tree**  

There are 17 varieties of trees within the orchard for students to choose from. Depending upon how many students will be participating in the orchard SAE, students can chose from one variety to many varieties. Below is a list of the tree varieties for students to choose from. For a visual layout of the orchard see Figure 2-3.  

1. 4 - Lorna Apricots  
2. 4 Royal Blenheim Apricots  
3. 4 Sierra Lady Peach (Cling)  
4. 4 Fay Elberta Peach (Cling)  
5. 4 Sullivan Peach (Freestones)  
6. 4 Corona Peach (Freestones)
<table>
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<th>Garden Produce</th>
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<td>4 Fantasia Nectarines</td>
</tr>
<tr>
<td>8</td>
<td>4 Red Gold Nectarines</td>
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<tr>
<td>9</td>
<td>4 Red Fuji Nagfu Apple</td>
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<tr>
<td>10</td>
<td>4 Newton Pippin Apples</td>
</tr>
<tr>
<td>11</td>
<td>4 French Prune</td>
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<td>12</td>
<td>4 Tulare Giant Prune</td>
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<td>14</td>
<td>3 Rainer Cherry</td>
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<td>15</td>
<td>3 Lapins</td>
</tr>
<tr>
<td>16</td>
<td>4 Nonpareil Almonds</td>
</tr>
<tr>
<td>17</td>
<td>4 Aldrich Almonds</td>
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**Summary**

The guide for the orchard SAE will outline the possibilities and responsibilities for students who choose to take on the opportunity. Such areas as pruning, irrigation, harvesting, and sales will be addressed for students to be successful. If students follow the guidelines they should have a successful SAE project with the ability to earn the previously mentioned degrees and proficiencies.
Chapter 4

Orchard Management Handbook

Within this chapter you will find the SAE Handbook containing the basic requirements for operating a successful orchard management SAE. The Handbook covers the basics from irrigating to pruning and harvesting. The handbook is designed to supply the basic skills of managing an orchard while encouraging students to conduct further research in order to promote learning outside of the classroom setting.
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Introduction

The purpose of this project is to provide students and advisors with a basic handbook on how to start an orchard SAE project. Orchard management could be a successful SAE project where students develop skills in horticulture. Students can learn the basics of running an orchard with the ability to further their knowledge with outside research. Within the handbook you will find the following contents:

1. Orchard Management Introduction
2. Pruning
3. Irrigation
4. Harvesting
5. And Sales

Each heading delves further into each topic outlining some of the basics within each category.
Orchard Management Introduction

With this handbook students will learn the basic principles of running an orchard. Students will be presented with simple guidelines in order to set up an orchard management SAE project. Students taking on this project will be able to compete in a number of competitions within the National FFA organization. Presenting them with many opportunities for recognition of their hard work and dedication. Students will also be encouraged to seek further knowledge beyond that which is presented in this handbook. As earlier stated the handbook is a simple guideline for them to follow. It is intended that students will take learning into their own hands, and research and investigate further orchard management practices in order to expand their knowledge.
Pruning

Time of year to Prune

- **Summer:** Summer pruning should try to be avoided altogether. There are only a very limited number of diseases that your trees might have that would suggest pruning in the summer. Fortunately these diseases are fairly uncommon. So again, avoid pruning in the summer if at all possible.

- **Winter:** Most pruning should be done in the winter season. This is a time when most of the various diseases that could affect a tree are dormant as well. Making them less likely to be spread throughout the orchard. Pruning in the winter also doesn’t waste any of the trees energy. If you were to prune in the spring or summer after vegetative growth has already occurred you are essentially wasting the nutrients and energy that the tree put into growing that branch, leaves, etc. Also pruning in the winter without foliage makes it simpler for you to see the way you are training your tree to grow.

How to prune

- **Tools:** There is a wide array of pruning tools. All suited for different purposes when pruning the tree. A list of common tools can be seen below:

  1. Extension Pruner
  2. Pruning Saw
  3. Pruning Knife
  4. Heavy Duty Loppers
  5. Loppers
  6. Hand Pruning Shears
Examples of pruning tools seen below:

- **Loppers**
- **Extension Pruner**
- **Pruning Saw**
- **Hand Pruning Shears**
- **Heavy Duty Loppers**
- **Pruning Knife**
Pruning Systems

- Modified Central Leader
  1. Apricot
  2. Peach
  3. Nectarine
  4. Plum
  5. Cherry
  6. Almond

- Open Center
  1. Apricot
  2. Peach
  3. Nectarine
  4. Plum
  5. Cherry
  6. Almond

- Central Leader
  1. Apple

What to prune

1. Cross-overs
2. Watersprouts
3. Suckers
4. Hangers
5. And any dead limbs
These diagrams show the appropriate areas that need pruning on most trees. As well as the terminology for various sections of the tree.

Note: The only one not pictured is dead branches and/or limbs, which are easily detectable due to their discoloration and lack of vegetation.
Irrigation

Reasons (Other than just keeping the tree alive)

- **Yield**: Supplying trees with the appropriate amounts of water will increase fruit yield. If there is a deficit in water this will stress the trees causing them to become less productive resulting in a lower crop yield.

- **Sugar content**: Students should research the effects of water stress on their tree varieties. Certain trees can produce sweeter fruit with higher sugar contents if properly water-stressed during the fruit bearing stage. A sweeter product could result in increased sales. However, thoroughly investigate the methods before applying any to the trees. If done incorrectly your harvest could prove to be substantially less. Even though you can grow sweeter fruit, this is an advanced technique. It is advised to do extensive research before applying this method in the field.

- **Types**
  - Micro-sprinklers

    - Micro-sprinklers are a common irrigation method in orchards. When first planted they may be right next to the tree directly applying water, however as the orchard matures the micro-sprinklers will be moved farther away from the tree. This results in micro-sprinklers evenly spaced in between trees. Which is a safeguard if one sprinkler goes out. The tree is still supplied with some amount of water from the opposite sprinkler.

    Micro-sprinkler lines must also be flushed. The time between each flushing will be determined by the quality of your water. The
poorer your water quality the more often you will have to flush the lines.

- Drip

1. Drip tape is also used within orchards for irrigation. It requires the same maintenance in regards to flushing the lines depending upon your water quality. As well as the same movement pattern as micro-sprinklers.

*Example of Micro-sprayer irrigation*

*Example of Drip Tape irrigation*
Harvesting

By hand: Due to the small size of the orchard and the large cost of using machinery students will need to pick fruit by hand. Although this can be less time efficient, it does allow for less damage to the fruit however. When picking by hand it is important to remember in order to be able to sell the fruit picked, you must not let it touch the ground or receive any scaring. These will disallow the sale of the fruit.

Mechanical: Even though mechanical harvesting will not be utilized for this SAE students are encouraged to research mechanical harvesting methods if they are interested in expanding their knowledge on fruit tree harvesting in industry. There are a variety of different harvesting tools that can be utilized in the fruit industry. Such tools can range from sweepers to blowers, and even shakers. All being designed to harvest specific types of fruit.
Sales

**Farmers market:** Students are encouraged to contact their local Farmer’s Market representative. They can utilize this opportunity to market themselves to the local community and increase profits.

**Local Stores:** Students are equally encouraged to contact their local grocery stores to further increase profitability and recognition of their product.

**U-Pick:** This is another opportunity for students to sell their product. It also allows the local community the opportunity to see where the students grow their product.

Having a variety of options for customers to buy your product increases your profitability and customer’s recognition of your product.
Chapter 5

Summary, Recommendations, and Conclusions

Summary

The purpose of this project was to create a Supervised Agriculture Experience (SAE) handbook for students interested in orchard management. This handbook is suggested to be implemented at San Benito High School for students of the Hollister FFA Chapter, to further develop orchard management skills using the program’s orchard. This project should be taken under consideration by the Hollister FFA students who are interested in an on campus SAE project, providing them with skills and hands on experience in managing a successful orchard. This opportunity will also provide the Hollister FFA program with student recognition at local fairs, farmer’s markets, and campus stores. As a whole, this handbook shall serve as an instructional guide with room for change so the project can be personalized for student interests.

Recommendations

For those doing senior projects of a similar nature

1. Plan accordingly if creating a senior project involving fruit trees or any other type of crop. If the authors had started the project at a different time there would be more personal references concerning diagrams and photos of certain systems used in orchard management.
2. Create a schedule for the project. In order to stay organized and on time it is essential to have deadlines outlined. This will keep the project on track without last minute frustrations. If planned accordingly the project may be able to be executed early.

3. If working with a partner:
   a. These authors were fortunate that they worked quite well together. If having a partner is being considered for the senior project, ensure that both parties will equally contribute to the project as the current authors have.

For those students with an SAE project

1. Students should research pruning season and methods for tree varieties.
2. Students should investigate the irrigation specifications for selected tree varieties.
3. Students should explain harvesting techniques for their specific orchard project.
4. Students should contact local Farmer’s Markets and stores to have their products sold locally as well as exploring the possibility of a U-pick system.

Conclusion

This handbook shall serve as an educational resource for Hollister FFA agriculture advisors as well as students interested in orchard management. This handbook should increase the usage of the Hollister FFA’s orchard located at the school farm. The authors hope this handbook will guide students with not only hands on experiences in orchard management and practices, but will also provide students with experience in sales, marketing, and industry operations. This handbook will hopefully be used by more than just the Hollister FFA program, and will serve as a guideline to other students within other chapters.
References


United States Fruit Standards. (n.d.). Fresh fruit standards [Data File] Available from http://www.ams.usda.gov/AM Sv1.0/ams.fetchTemplateData.do?template=TemplateN&navID=FreshFruitGradeStandards&rightNav1=FreshFruitGradeStandards&topNav=&leftNav=&page=FreshMarketFruitStandards&resultType=&acct=freshgrdcert

Appendix
Introduction

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  2. Peach
  3. Nectarine
  4. Plum
  5. Cherry
  6. Almond

- **Open Center**
  1. Apricot
  2. Peach
  3. Nectarine
  4. Plum
  5. Cherry
  6. Almond

- **Central Leader**
  1. Apple

**What to prune**

1. Cross-overs
2. Watersprouts
3. Suckers
4. Hangers
These diagrams show the appropriate areas that need pruning on most trees. As well at the terminology for various sections of the tree.

Note: The only one not pictured is dead branches and/or limbs, which are easily detectable due to their discoloration and lack of vegetation.
Plant Structure
A Visual Guide for Pruners
Irrigation

Reasons (Other than just keeping the tree alive)

- **Yield:** Supplying trees with the appropriate amounts of water will increase fruit yield. If there is a deficit in water this will stress the trees causing them to become less productive resulting in a lower crop yield.

- **Sugar content:** Students should research the effects of water stress on their tree varieties. Certain trees can produce sweeter fruit with higher sugar contents if properly water-stressed during the fruit bearing stage. A sweeter product could result in increased sales. However, thoroughly investigate the methods before applying any to the trees. If done incorrectly your harvest could prove to be substantially less. Even though you can grow sweeter fruit, this is an advanced technique. It is advised to do extensive research before applying this method in the field.

- **Types**
  - Micro-sprinklers

    - Micro-sprinklers are a common irrigation method in orchards. When first planted they may be right next to the tree directly applying water, however as the orchard matures the micro-sprinklers will be moved farther away from the tree. This results in micro-sprinklers evenly spaced in between trees. Which is a safeguard if one sprinkler goes out. The tree is still supplied with some amount of water from the opposite sprinkler. Micro-sprinkler lines must also be flushed. The time between each flushing will be determined by the quality of your water. The
poorer your water quality the more often you will have to flush the lines.

- **Drip**

1. Drip tape is also used within orchards for irrigation. It requires the same maintenance in regards to flushing the lines depending upon your water quality. As well as the same movement pattern as micro-sprinklers.

*Example of Micro-sprayer irrigation*

*Example of Drip Tape irrigation*
Harvesting

**By hand:** Due to the small size of the orchard and the large cost of using machinery students will need to pick fruit by hand. Although this can be less time efficient, it does allow for less damage to the fruit however. When picking by hand it is important to remember in order to be able to sell the fruit picked, you must not let it touch the ground or receive any scaring. These will disallow the sale of the fruit.

**Mechanical:** Even though mechanical harvesting will not be utilized for this SAE students are encouraged to research mechanical harvesting methods if they are interested in expanding their knowledge on fruit tree harvesting in industry. There are a variety of different harvesting tools that can be utilized in the fruit industry. Such tools can range from sweepers to blowers, and even shakers. All being designed to harvest specific types of fruit.
Sales

**Farmers market:** Students are encouraged to contact their local Farmer’s Market representative. They can utilize this opportunity to market themselves to the local community and increase profits.

**Local Stores:** Students are equally encouraged to contact their local grocery stores to further increase profitability and recognition of their product.

**U-Pick:** This is another opportunity for students to sell their product. It also allows the local community the opportunity to see where the students grow their product.

Having a variety of options for customers to buy your product increases your profitability and customer’s recognition of your product.