



Orchard Planning

Center Pivot and Linear Irrigation
for Your Permanent Crops



The Leader in Precision Irrigation®



Orchard Planning

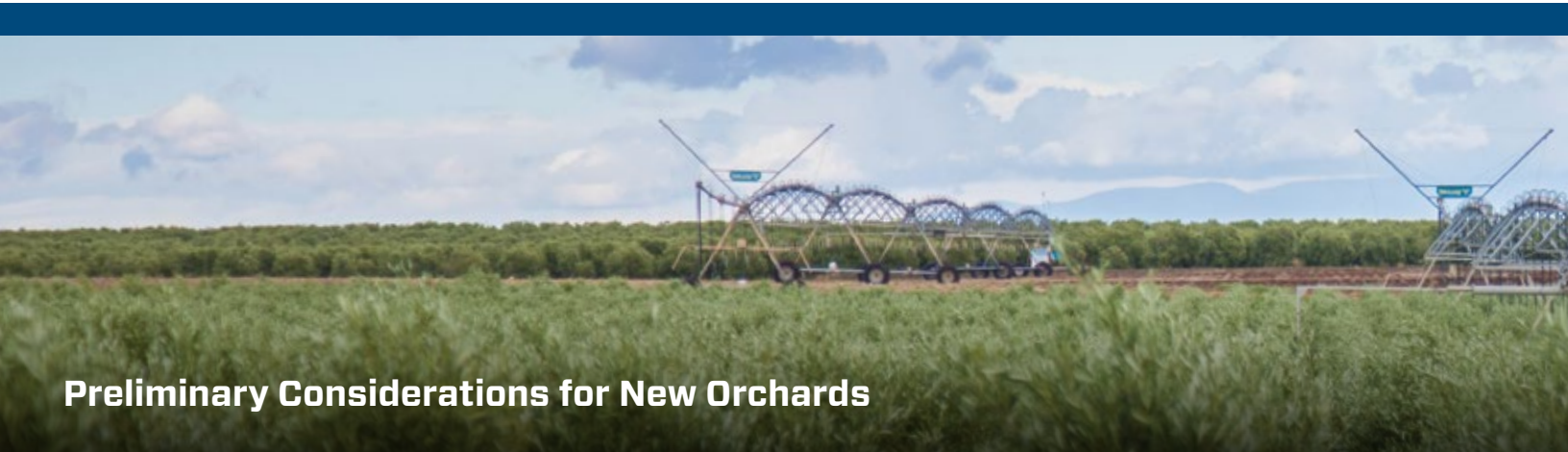
The purpose of this guide is to assist growers and Valley dealers in orchard planning, field preparation, understanding important features, chemigation and the use of center pivot or linear machines for new and existing orchards. The guide assumes the grower has no prior knowledge of center pivot and linear irrigation or of orchard farming. Much of this information may seem obvious to the experienced grower. However, this guide will provide even the most experienced grower a broad-based knowledge of planning, installing and operating center pivot and linear Irrigation machines on orchards.

For more specialized information about orchard crops, contact your local nursery or a horticulturist. Contact your local Valley® dealer with questions on specifications, orchard planning or equipment installation. You should read this entire guide as the first step in the planning process.

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Orchard Planning



Preliminary Considerations for New Orchards

The first step of the planning process is to determine the number of hectares (acres) available for irrigation. The following factors should be considered: field terrain, field shape, water resources and number of trees desired.

Field terrain is an important consideration for equipment operation. Valley center pivot and linear machines can be operated on fields with slopes. Slope limitations are based on span length, tire sizes and profile heights. Information on field elevation must be provided for your Valley dealer to properly design a center pivot or linear for the field.

Areas of a field that have slopes greater than equipment limitations may have to be irrigated with other forms of irrigation equipment. A combination (such as pivot or linear with drip or micro-spray) will still provide a more cost-effective method of irrigation than one comprised solely of drip or micro-spray.

Field shape must be considered to determine whether center pivot or linear equipment should be used. For example, if a field is long and narrow, it may be necessary to use a linear irrigation machine. Growers should contact their local Valley dealer to help them determine which type of equipment might be best for their particular field.

The availability of water is a very important issue. Growers need to consider all potential water resources. For center pivot and linear irrigation machines to operate efficiently and effectively, there must be sufficient water available to meet crop needs at peak periods of need.

Crop Considerations

Using center pivots and linears for your orchard crop is relatively easy. However, as with all crops, irrigating requires you to have some preliminary information about your crop and its needs. Each type of tree crop has its own water requirements. It is very important to understand the maximum water requirements of your crop at full maturity. Factors that affect a crop's water requirements may include climate, soil type, tree variety and numerous other variables.

Filler Crops

With a new orchard, you will experience a certain number of years before your trees will mature and bear fruit. This can be a problem for many growers because there is no revenue being generated during this period of time.

To help off-set the waiting period, you can grow seasonal crops between the tree rows. Many vegetable crops are ideal for this purpose (for example, onions or potatoes). Growing these crops during the interim period will allow you to obtain some revenue while you wait for your trees to mature.



Planning with your Valley dealer

The following is required information for your Valley dealer to provide a detailed recommendation for center pivot or linear machine design and sprinkler package design:

Which type of system, center pivot or linear, will be used to irrigate the orchard? Your Valley dealer can design both types to determine which will best fit your needs.

What are the maximum number of liters (gallons) of water needed per tree per day at maturity? If a second crop and/or an above-canopy sprinkler package will be required for washing or cooling the canopy, the number of liters (gallons) of water per minute for these applications are also required.

Will a combination of multiple sprinkler packages operate at one time?

What type(s) of soils are in the field?

What is the climate (hot/dry/cool/humid)?

What are the maximum number of hours per day that the irrigation system can operate?

What is the tree canopy height at maturity?

What is the distance in meters (feet) between each tree planted in the same row?

What is the distance in meters (feet) between each row and the number of rows within the field? (See the table on the next page with various span/overhang lengths and row spacings beneath a span.)

Orchard Planning



Valley 8000 Series

TREE SPACING BETWEEN ROWS

Span Length		6 Rows Per Span		7 Rows Per Span		8 Rows Per Span		9 Rows Per Span		10 Rows Per Span	
meters	ft	meters	ft	meters	ft	meters	ft	meters	ft	meters	ft
34.29	112.50	5.72	18.75	4.90	16.07	4.29	14.06	3.81	12.50	3.43	11.25
35.08	115.10	5.85	19.18	5.01	16.44	4.39	14.39	3.90	12.79	3.51	11.51
41.20	135.20	6.87	22.53	5.89	19.31	5.15	16.90	4.58	15.02	4.12	13.52
42.67	140.00	7.11	23.33	6.10	20.00	5.33	17.50	4.74	15.56	4.27	14.00
48.77	160.00	8.13	26.67	6.97	22.86	6.10	20.00	5.42	17.78	4.88	16.00
54.87	180.00	9.15	30.00	7.84	25.71	6.86	22.50	6.10	20.00	5.49	18.00
56.33	184.80	9.39	30.80	8.05	26.40	7.04	23.10	6.26	20.53	5.63	18.48
56.90	186.70	9.48	31.12	8.13	26.67	7.11	23.34	6.32	20.74	5.69	18.67
62.45	204.90	10.41	34.15	8.92	29.27	7.81	25.61	6.94	22.77	6.25	20.49
68.60	225.00	11.43	37.50	9.80	32.14	8.58	28.13	7.62	25.00	6.86	22.50

Valley 8120 Series (International)

TREE SPACING BETWEEN ROWS

Span Length		6 Rows Per Span		7 Rows Per Span		8 Rows Per Span		9 Rows Per Span		10 Rows Per Span	
meters	ft	meters	ft	meters	ft	meters	ft	meters	ft	meters	ft
33.44	109.70	5.57	18.28	4.78	15.67	4.18	13.71	3.72	12.19	3.43	10.97
36.53	119.90	6.09	19.98	5.22	17.13	4.57	14.99	4.06	13.32	3.65	11.99
38.95	127.80	6.49	21.30	5.56	18.26	4.87	15.98	4.33	14.20	3.90	12.78
43.37	142.30	7.23	23.72	6.20	20.33	5.42	17.79	4.82	15.81	4.34	14.23
49.13	161.20	8.19	26.87	7.02	23.03	6.14	20.15	5.46	17.91	4.91	16.12
54.80	180.00	9.13	30.00	7.83	25.71	6.85	22.50	6.09	20.00	5.49	18.00
60.62	198.90	10.10	33.15	8.66	28.41	7.58	24.86	6.74	22.10	6.06	19.89
66.37	217.70	11.06	36.28	9.48	31.10	8.30	27.21	7.37	24.19	6.64	21.77
72.16	236.70	12.03	39.45	10.31	33.81	9.02	29.59	8.02	26.30	7.22	23.67

NOTE: All Valley 8120 Series components fit in standard ocean cargo containers.

Valley 8000 Series - Overhang



TREE SPACING BETWEEN ROWS

Overhang Length	
meters	ft
2.74	9.00
5.49	18.00
8.23	27.00
10.97	36.00
13.72	45.00
16.46	54.00
19.50	64.00
22.25	73.00
24.99	82.00

Divide the overhang length by the row spacing to get the number of rows beneath the overhang

After you and your Valley dealer have selected a design plan for your orchard, the next step is to prepare the field. The following section will discuss strategies for successful field preparation. For growers with an existing orchard, please refer to page 15 (Linear Applications).



Center Pivot



Linear

Field Preparation



Marking the Field Rows

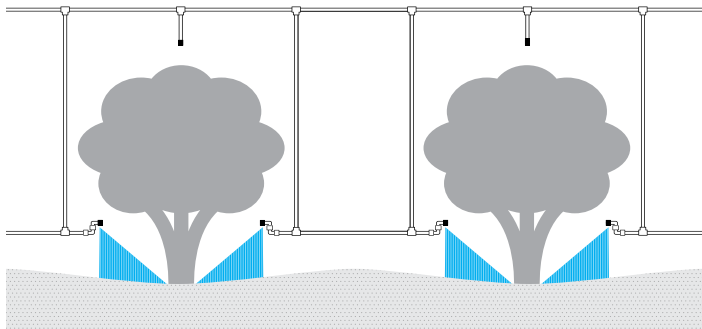
The best method to locate the tree rows beneath a center pivot or linear is first to install the center pivot or linear machine in the field. Place a sprinkler drop on the spans at each tree row location. The sprinkler chart report will show the position along the center pivot or linear for each tree row.

The drop will be long enough to place the sprinkler .61m (2 ft.) above the ground surface. A small wire will be strung from one drive unit base beam to the next. Each drop will be tied to the wire, securing the drop position from moving due to wind. The sprinkler device will have its distribution plate removed so the water stream exiting the nozzle will create a small trench in the soil as the machine moves through the field. If the machine cannot be run with water, an alternate method is to attach a heavy object to the drop hose that will drag on the ground leaving a mark in the soil for the tree row.

Contouring Your Field

You should contour your field to maximize your water application and decrease water run-off. Generally, it is best to contour the ground between the rows into 10-20 cm berms. Do not contour your field so that your trees are planted on the berms. This will dramatically increase water runoff and lower application efficiency.

Your trees should be planted between the contoured berms. You should leave the ropes and scribing objects on your system until all of your furrows are dug. This will allow you to re-scribe your rows if the markings erode while you are digging your furrows.



Furrow Dikes

In some cases, it may be necessary to contour furrows for certain types of terrain. If parts of your field are located on hilly ground, you should contour your field to retain the maximum amount of water for your trees. Furrow dikes should be built in cases where the furrows are parallel with the slope of the hill. Furrow dikes should be built between each tree on the slope. Therefore, you may want to wait to construct the furrow dikes until after your trees have been planted. Using furrow dikes will help to minimize water runoff and increase application efficiency.

If your furrows are dug horizontally across the slope, you should contour the land between the furrows to retain any water that would drain down the slope. To do this, you can build up the soil between the furrows.

Tree Placement

Tree placement is very important. The tree canopy size at full maturity will determine how close together each tree should be planted. As discussed above, your nursery should be able to provide you with an approximate tree canopy size.

Trees should be planted in anticipation of forming a hedgerow at maturity. There are two main reasons for growers to plant their trees in hedgerows. First, the hedgerow places trees closer together for more efficient water application. Valley irrigation machines apply water continuously. This ultimately means that any large gap between trees wastes water. Second, the hedgerow formation helps to prevent wind damage. The outside row acts as a wind barrier, which helps to protect the inner rows of trees.



Valley Machines for Orchards



Standard Machine Modifications

Valley equipment used for orchards is virtually the same used for traditional crops. The span height and sprinkler package are the only distinguishing features. If you already own a standard-height Valley (model 8000 or 8120) center pivot or linear (2.74 m), it is possible to convert it into a high profile (3.75 m) or an ultra-high profile (4.6 m) machine. Valley Irrigation has developed a retrofit package to convert most standard-height Valley machines. Contact your local Valley dealer if you would like to learn more about this option.

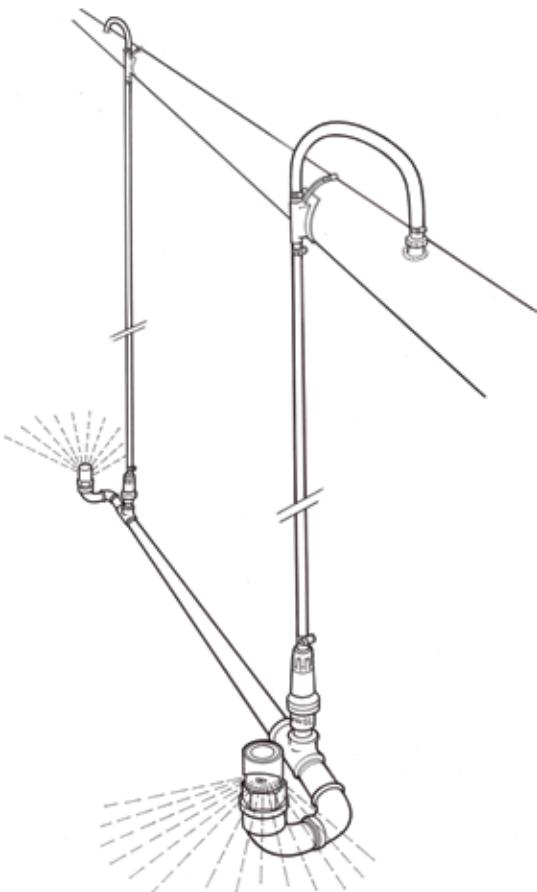
Valley Tree Drops

One of the key characteristics of using Valley equipment on orchards is that it applies water below the leaf canopy. By utilizing hose drops, water is brought from the overhead span and supplied directly to the root zone. This method ensures high efficiency and uniformity of water application.





Spray Heads



The spray head used for Valley equipment used on orchards applies water with a 180-degree spray. There are two benefits to using a 180-degree spray head. First, water is only applied to the root zone, where water is most needed. This helps to conserve the water supply. Second, by limiting the application of water to the critical areas, this helps to discourage weed growth in the areas between tree rows.

Equipment Maintenance

An important part of ensuring the long life of any equipment is proper operation and maintenance. Be sure to read your Valley owner's manual for details about equipment maintenance. If you have any questions, contact your local Valley dealer.

Orchard Maintenance

Fertigation

Fertigation is the injection of fertilizer into irrigation water for application to various crops and soils. Applying fertilizer with your center pivot or linear works very well because of the equipment's high rate of application uniformity and efficiency.

Benefits to the grower:

Expanded utilization of the irrigation machines

The irrigation equipment can be used as a large sprayer to apply fertigation, thus reducing or eliminating the need for ground rigs or aerial spraying.

Uniformity of application

Application of fertilizer through automated irrigation equipment has been proven to be superior in uniformity or coverage over conventional methods, if it is in good working order and operated properly.

Timely application

Center pivots or linears can apply fertilizer on an "as needed" basis.

Controlled amounts of fertilizer

The amount, frequency and timing of fertilizer application can be controlled to optimize both effectiveness and cost, to provide for optimum yields. It is also possible that the amount of nutrients needed may be reduced.

Chemical incorporation

Incorporation and/or activation of chemicals such as herbicides can easily be accomplished through the water applied.

Reduced labor

Labor is almost eliminated by using center pivots or linears versus ground application.

Effective and economical

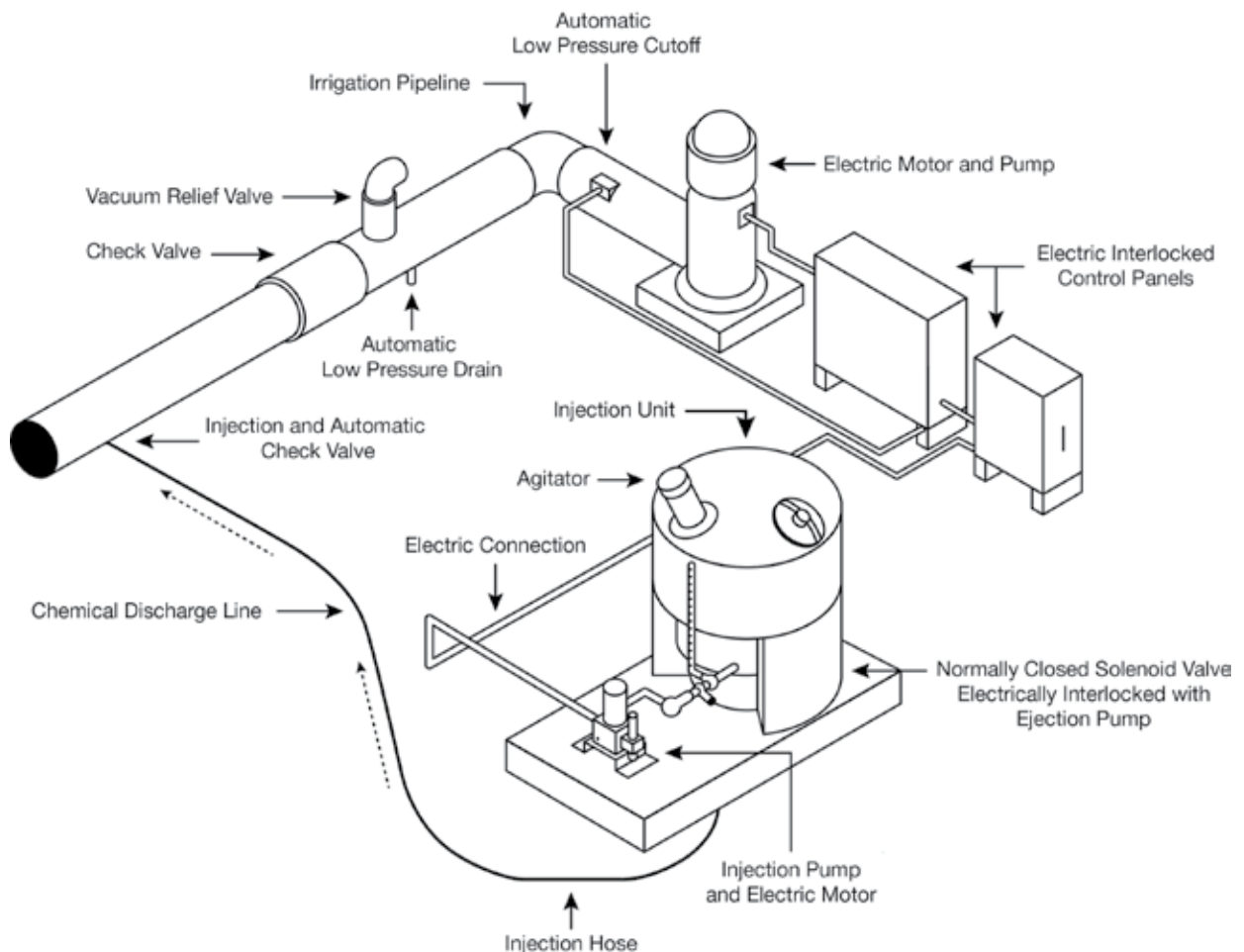
Fertigation has shown to be as effective as (or more effective than) ground or aerial application, while saving one-third to one-half of the cost of conventional application.

If you plan to fertigate with your Valley equipment, you should consider the following factors:

- Soil type
- Crop requirements
- Selection of materials
- Governmental regulations
- Corrosive properties of chemicals and their effect on galvanizing

To assist with the preceding issues, contact your local agricultural chemical dealer and your nursery. These sources can provide the best advice concerning fertigation for your orchards. Additionally, you should consult your local branch of the Environmental Protection Agency or other applicable governmental body regarding the regulated use of the products you intend to use.

In addition to your Valley equipment, you will need some additional equipment to fertigate your orchard. First, you will need injection equipment, which includes a pump and other accessories needed to inject fertilizer into the water supply. Second, you will need safety equipment (anti-pollution devices). Contact a local dealer or manufacturer of these products to obtain specific information and pricing.



Orchard Maintenance



Tree Pruning

Pruning your trees is a necessary part of orchard maintenance. You must keep your tree canopies below your machine's spans. This will prevent damage to your equipment and allow it to operate at its highest efficiency. Additionally, pruning your trees results in easier harvesting.

There are various types of pruning equipment available to orchard growers. Some pruning machines are front-end mounted on tractors, while others are single units somewhat like specialized tractors. These pruning machines have the capability to prune trees in a variety of ways. Contact a local dealer or a manufacturer for more complete information about pruning equipment and methods.

Water Practices

For optimal results for your orchard, the best watering practice is to irrigate less frequently with heavier applications.

There are two main reasons for this:

- Light water applications can promote shallow root development, whereas heavier applications allow water to percolate deeper into the soil, promoting deep root development.
- Light water applications are susceptible to a greater rate of evaporation due to prolonged surface wetting, which is especially true in more arid climates. A heavier water application of 20-30 mm (0.7-1.2 in) per application will allow the soil to bank water and allow the tree to draw upon this bank over a 5-10 day period between applications.

Note: The application amount should not exceed the ability of the soil to absorb it. You should observe the last span of the center pivot to detect any runoff, since this is where the heaviest application will occur.



Linear Machine Application



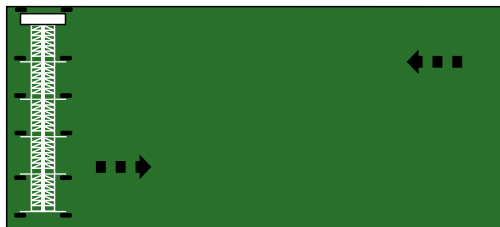
New Orchards

Linear irrigation machines can be utilized for a variety of new field applications. Typically, growers use linears where the shape of their fields will not allow them to use center pivots. For example, if a field is long and narrow, a center pivot would not allow the grower to irrigate most effectively. However, in this case, a linear would allow the grower to irrigate up to 98% of the field.

New fields for linear systems are prepared the same way as they are for center pivots.

Once the linear is installed, it is used to scribe the row markings in the soil. Furrow digging, field contouring and tree placement are just as important in linear field preparation as they are in center pivot field preparation.

In addition to orchard fruits, crops such as grapes can be irrigated with linears, which provide a high degree of uniformity and water application efficiency to most trellis-grown fruit.



Existing Orchards

When a grower has an existing orchard and would like to switch to mechanized irrigation, a linear may possibly be installed. Installing a linear on an existing orchard is dependent upon two factors:

- First, the field must be square or rectangular in shape. If the field is not square or rectangular, it will not be possible to irrigate it with a linear.
- Second, even if the field is square or rectangular in shape, the tree rows must be straight. If the tree rows are not straight, the hose drops will be unable to move through the orchard freely without becoming entangled in the trees.

If your existing orchard does not meet the above criteria, you may want to contact your Valley dealer to determine if there is a possibility of installation with minor modifications to the equipment or your orchard.

Your Trusted Partner



Putting the grower first is not just a slogan at Valley, but part of our culture.



See your local authorized Valley dealer for complete details.

valleyirrigation.com

Valmont® Irrigation has a policy of continuous product improvement and development. As a result, certain changes in standard equipment, options, price, etc. may have occurred after the publication of this brochure. Some photographs and specifications may not be identical to current production. Your local Valley® dealer is your best source for up-to-date information. Valmont Irrigation reserves the right to change product design and specifications at any time without incurring obligations.

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