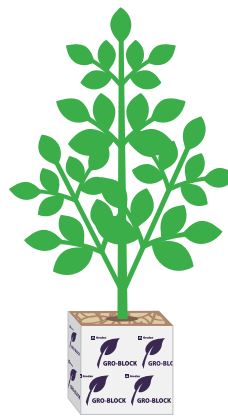


# Introduction to Crop Steering

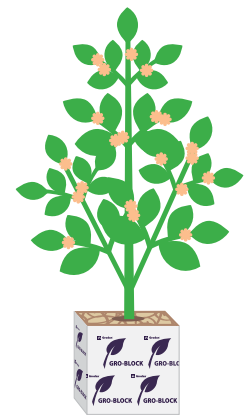
Indoor cannabis cultivation has several benefits, including the ability to control our climate, light intensity, and irrigation which plays a significant role in regulating the way our plants grow. Every action we take from the adjustment of day/night temperature, humidity, light intensity, day length, irrigation volume and frequency, to the timing and way we defoliate our plants, steers the plant's physical and chemical growth response. So, it's essential to understand how these factors affect a plant's development and how to use them to your advantage. By taking regular measurements of climate and rootzone conditions in combination with tracking plant growth you can determine how to get the best performance out of your crop.

## What is Crop Steering?

Crop steering is a method of managing plant growth by adjusting irrigation and climate to achieve a desired response from the plant. By adjusting environmental and root-zone conditions growers can steer plant growth vegetatively or generatively. Both vegetative and generative steering can be used at every stage of growth to keep the plants in balance throughout its lifecycle.



Vegetative Growth is when the plant produces roots, leaves and stems for a strong structure



Generative Growth is the development of fruits and flowers

## Crop Steering Using Irrigation

Crop steering can be achieved in part through irrigation. The volume, frequency, and timing of irrigation events applied influences the plant's response and steers the growth. Adjusting the irrigation strategy specifically for the environment, genetics, and stage of development will optimize the plant's growth and maximize final product yield and quality.

Root Zone		Vegetative	Generative
WC		↑	↓
WC Decrease Night Start - Stop Time		↔	↔
Irrigation Frequency		↑	↓
EC		↓	↑
Temp Substrate		↑	↓

+Chart shows examples of irrigation steering. These are specific to certain crops and varieties so in some cases something that creates a generative action in one type of plant might be a vegetative action for another. So, it's important to test them and measure how the plants react.

If you want your plants to grow more vegetatively, you can implement a vegetative irrigation strategy by:

- Maintaining a higher overall WC in the rootzone
- Having smaller dry backs between day time irrigation events and overnight
- Using small shot sizes at a high frequency of irrigation
- Lowering the EC at the dripper and in the rootzone
- Maintaining higher rootzone temperatures.

These actions will help the plants grow and recover from transplant faster while maintaining vigor.








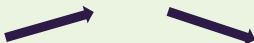
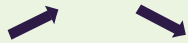









If you want your plants to be more generative, you might:

- Decrease the overall WC in the rootzone
- Increase the dry backs between each irrigation and overnight by delaying the first irrigation of the day and stopping irrigation earlier before night
- Decrease irrigation frequency while increasing the volume of each shot
- Increase the dripper and rootzone EC
- Maintain lower substrate temps.

To figure out how each cultivar would react it's important to try out these strategies while performing regular crop registration of plant height, node spacing, root development, overall plant development, and health. This will help determine how each cultivar will respond to the irrigation steering.

## Crop Steering Using Climate

Like irrigation, climate has a profound effect on how the plants grow and can be used as a tool to steer growth. Climate steering techniques shown in the next chart should be tested to see how they affect each cultivar. For some plants, switching the day night cycle to 12 hours on and 12 hours off are used for inducing flower. Like the change in photoperiod, other climate factors can be changed to steer the plant's growth vegetatively or generatively. Having overall high temperatures is more vegetative, keeping the plant more active while overall lower temperatures slows growth and mimics the natural seasonal changes that plant would experience towards the end of its lifecycle, thus steering it more generative. Changes in the difference between day and night temperatures can potentially control stretching, with big differences increasing inter-node spacing and small differences decreasing. The speed of the temperature changes from day to night / night to day, increasing or decreasing humidity, the number of air exchanges in the room, and in greenhouses, the heating temperature used (pipe temperature) also helps to steer the plant. So it's important to keep track of climate parameters in relation to crop development.

Climate	Vegetative	Generative
Temperature 24 hours 		
Difference Tday-Tnight 		
Speed Temp Change 		
Humidity Deficit (gr/m3) 		
Ventilation / Air Exchange 		
Pipe Temperature 		

+Chart shows examples of climate steering. These are specific to certain crops and varieties so in some cases something that creates a generative action in one type of plant might be a vegetative action for another type. So it's important to test them and measure how the plants react.

## Knowing How and When to Steer Plant Growth (Crop Registration)

Most every indoor gardeners know how much they grow per light and how good it was but knowing how they got that result and how to repeat the result time after time is key.

“The more you know the better you grow”

Having a thorough understanding of how your plants develop is a critical step to growing a consistent and quality crop time after time. Notes on how the plants develop and react to climate and irrigation conditions will be critical in helping determine how your plants react to the different steering strategies outlined above. At every stage of growth you should take detailed notes on the root development speed, quality, plant height, stem diameter, leaf/stem color, and node spacing. You should also note the time it takes flowers to develop and how they fill out, in addition to rootzone WC and EC measurements in relation to climate conditions. All of these parameters will help you determine the optimum irrigation and climate strategies to apply to your plants at the right time throughout the plant's lifecycle.

For more information about crop steering, contact your local Grodan account manager or contact us via [www.grodan101.com](http://www.grodan101.com).

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