Non-Chemical Weed Control for Small Acreage Farmers in Nevada

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Introduction

Small acreage farms in Nevada normally have less than 20 acres in production with many of these producers receiving off-farm income. The number of small acreage farms and farmers are increasing throughout Nevada. Requests for assistance and field visits by Extension faculty indicate excessive weed populations are the primary limitation to successful crop production for most small acreage, crop producers in Nevada. Many small acreage farming operations are organic-based or strongly prefer weed management recommendations that preclude the use of conventional herbicides. The purpose of this fact sheet is to provide basic information and resources on non-chemical weed control options for these small acreage farmers.

Non-Chemical Weed Management Basics

Weeds damage crops by competing with them for space, sunlight, nutrients and water. Some weeds also release chemicals that restrict crop plant growth. Weeds can interfere with the management and harvest of the crop. All well designed weed management operations attempt to avoid these problems in the short and long term by:

1) eradicating or severely reducing weed populations before or at the time the crop is planted and until the crop is large enough to compete with the target weeds; 2) reducing overall weed populations by preventing the production and survival of weed seeds or vegetative parts; and 3) preventing the introduction of new weeds onto the property using ongoing scouting and targeted eradication of all newly discovered weed species.

While several individual options are available for managing weeds without conventional herbicides, the most effective approach incorporates multiple tactics applied in a concerted manner.

Non-Chemical Weed Management Tactics

The ideal first step in any non-chemical weed control program is to plant crops into weed free soils. Since almost all soils have existing weed seed in them, implementing a pre-plant weed control program is important. Most of these programs involve irrigating the soil before the crop is planted followed by tillage to kill germinating weed seeds or existing weeds. This practice normally needs to occur more than once on soils that have heavy weed infestations or have not been actively producing crops for a number of years.
This need for multiple pre-plant treatments is related to weed species growth cycles. In Nevada, producers must deal with winter annual, summer annual, biennial and perennial weeds.

Winter annual weeds begin growth during the fall, winter and early spring. They complete their life cycle by early summer when their seeds drop. Summer annuals also complete their life cycle in one season but begin growth when the soil temperatures warm in late spring to early summer. They are generally mature by the first frosts of the season. Since these types of weeds begin to grow at completely different times of the year, a single pre-plant treatment is not effective.

Biennial weeds require two years to complete their life cycle. The plant grows from a seed the first year but does not typically flower or produce seeds until the second growing season. Because biennials grow from seeds and existing plants, a single pre-plant treatment is seldom effective unless timed perfectly to kill the germinating seeds and the existing plants before they are mature enough to produce viable seeds.

A single, pre-plant mechanical treatment is seldom effective against established perennial plants. Perennial weeds reproduce from seeds and existing plants that often grow for years. They can also reproduce from small plant parts that have been cut by tillage operations, making the problem worse. Some perennial weed populations can be sharply reduced by frequent cultivation, grazing or mowing to prevent adequate food production by the targeted weed. If the proposed cropping site is dominated by deep rooted, perennial weeds, planting should be delayed until these plants have been eliminated. Removing these weeds is nearly impossible once crops have been planted.

Well-planned crop rotations are a basic component of any non-chemical weed control effort. Properly applied crop rotations allow multiple opportunities to disrupt weed growth using cultivation. This impact is especially useful when warm and cool season crops requiring different planting dates are used. Rotations of different crop species within the cool or warm season categories can also be used effectively. For example, a very hardy, rapidly maturing, cool-season vegetable such as radish could be followed by a less hardy cool-season species such as lettuce. Then a warm-season vegetable such as beans can be planted, followed by another cool season plant in the fall. Obviously, the more times the crop is rotated, the greater the opportunity to disrupt weed growth between crop rotations.

Another technique important in a non-chemical weed management program is to select competitive, rapidly growing crops that will suppress weed growth for the first two to three rotations. Planting cover crops that are not harvested but used to smother weeds and then enrich the soil is a similar and popular technique used to reduce weed populations. When selecting seeds for planting, it is critical to buy high-quality seeds from a reputable dealer. These seeds have been tested for germination should be certified weed free. Select crop varieties that are adapted to the locale and possess high resistance to local diseases. This helps insure that the crops are healthy, grow rapidly and compete more effectively with weeds. All crops should be planted in a manner that allows them to rapidly form closed canopies, shading the ground and reducing weed growth. Narrow row widths and seeding for high plant populations are commonly used to facilitate this technique.

Planting crops at the proper time and when soil temperatures are adequate for rapid
growth is also important. Planting winter or summer annual crops before the soil warms enough for rapid growth results in long germination periods and slow initial growth by the seeded crops. Many weed species can and do grow well in these colder soil temperatures, gaining a competitive advantage over the seeded crops and complicating the application of mechanical weed control techniques.

Mulches that cover the ground to a depth adequate to retard weed seed germination and growth are commonly used by organic producers to suppress weed populations. Mulches can be made from plant matter, minerals such as gravel or synthetic (plastic) materials. Dark colored, synthetic mulches placed over planting beds are being used successfully throughout Nevada. In this technique, the mulches are placed over the bed with vegetable starts transplanted through holes in the material. The mulch not only reduces weed populations by providing a physical barrier, it warms the soil resulting in more rapid crop growth. All mulches also tend to conserve moisture in the soil, so applications of irrigation water need to be adjusted accordingly.

The use of precision irrigation techniques can also be used to reduce weed populations. Surface or subsurface drip systems provide water to the planted crops without wetting the surrounding soil. This results in reduced weed seed germination and growth due to a lack of moisture unless significant rainfall occurs. In Nevada, frequent rainfall is rare and maintaining dry soil between crop rows and plants is a practical if precision irrigation techniques are used.

Proper placement of fertilizers is also beneficial in any non-chemical weed control effort. Broadcast applications of fertilizers should be avoided as they provide food to weedy species growing between and around crop plants. Fertilizer applications concentrated on the crop rows provide needed nutrients to the crop but not to the weeds. When using this approach, remember to apply only enough fertilizer necessary for the much smaller area that occurs under and around the crop plants.

Mechanical weed control options include: plowing, disking, rototilling, mowing, cultivating, hoeing, burning, hand-pulling and any other technique that physically kills growing weeds or buries weed seed so deeply that successful germination is prevented. The method chosen is generally driven by the crop being planted, the size of the farmed area, weed species present and labor available.

If performed too often, mechanical or tillage operations can result in degradation of soil quality. This occurs primarily from a loss of organic matter and soil structure. The more frequent and deeper the tillage operation is, the higher the chance that more damage will occur. Therefore, choosing a control method that causes the least soil disturbance while achieving adequate weed control levels is recommended when using mechanical practices.

When planning a mechanical control program, remember that the easiest time to kill weeds is when they are in the seedling stage. Often, a light cultivation will disrupt the growth of seedlings at minimal cost and soil disturbance while older weeds will require significantly more effort to kill. Weed seedlings can also be easily killed by flaming without disturbing any soil. Frequent mowing is another mechanical technique that does not disturb soils but can prevent weed seed production.
Finally, any producer who manages a farm using non-chemical control methods needs to understand that some weeds will always be present. It is not economically possible or even practical to control every weed in a field. The goal is to reduce weed populations to a point that they do not significantly reduce crop production and quality.

Any successful weed management plan requires the application of several techniques over the course of a season. This requires planning, adapting to unforeseen events and diligent application of the weed management plan. Successful weed management is also a long term endeavor, as missing one year of successful control may negate many previous years’ efforts.

**Additional Resources**


