CC170 Irrigated Pastures for Nebraska

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Irrigated Pastures for Nebraska

Effective Irrigation Encourages

- Increased Quality Forage Production
- Higher Carrying Capacity Per Acre
- More Pasture Days Per Year

EXTENSION SERVICE - UNIVERSITY OF NEBRASKA
COLLEGE OF AGRICULTURE AND U.S. DEPARTMENT
OF AGRICULTURE COOPERATING W. V. Lambert, Director
Irrigated Pastures for Nebraska

Irrigation is rapidly gaining in importance on Nebraska farms. From 1941 to 1957 irrigation acreage increased from 685,890 to 2,395,000 acres. On many Nebraska farms irrigation can be used to grow high quality, high yielding forages at a low cost. Quality forages can be used by livestock, resulting in a greater economic return for Nebraska farmers.

Pastures can be irrigated on either level, fertile land or on some of the more rolling farm lands.

Plan Your Pasture Program

A diversified farm program demands much long-range planning. This is particularly true for the farmer who plans to change from a cash crop system to a livestock enterprise in addition to changing from non-irrigated to irrigated farming.

Different crop rotations will need to be planned. Livestock numbers for the unit will have to be determined on a basis of feed requirements and the amount of feed that can be produced in the crop rotation. When calculating the feed requirements for livestock, the need for summer forage will have to be determined. A suitable pasture program for an irrigated farm enterprise requires as much planning as any other part of the farm program.

Consider the following suggestions for a successful irrigated pasture program:

1. **Include the pasture in your cropping system.** Move the pasture from field to field in a good rotation system.

   From a soil improvement standpoint three or four years is ample time for a pasture in the rotation. Including the pasture in the crop rotation will give more of the farm the benefit of soil structure im-
provement and increased fertility. The pastures themselves have a higher yield potential when re-established on crop land at more frequent intervals.

On rolling land a farmer may wish to leave a field in pasture for a longer period than on level land. Erosion losses and risks in establishment are somewhat greater on such land.

Pastures should produce well for five years or more, but should be re-established whenever loss of production occurs.

2. Provide sufficient acreage for the number of animal units\(^1\) in your livestock program.

Even on irrigated pastures, stocking rates may vary greatly with fertility, weather, class of livestock, species of grasses and legumes, and management. Properly managed rotational or strip grazing systems have frequently permitted stocking rates 10-20% greater than continuous grazing.

High producing dairy cattle should not be required to graze as closely as dry cows, heifers, or beef animals. However, heifers and dry cows can follow the high producing dairy animals and graze the forage more closely, if desired.

During a 150-day grazing season, an acre of well managed irrigated pasture should provide ample forage for two or three animal units. Good irrigated pastures in Nebraska should produce 5,000 to 8,000 pounds of milk or 500 to 800 pounds of beef per acre.

3. Consider use of supplemental feed and temporary pasture at certain times of the year.

Temporary pasture crops may be used to furnish pasture for livestock early in the spring before the perennial grasses and legumes have made sufficient growth to permit their use as pasture. They also may be used to provide pasture in the fall when grazing on permanent pastures should be ended. Proper planning may permit the use of sweet clover, late summer-seeded rye, or rye and Madison vetch to extend the grazing season approximately 30 days. Some farmers have seeded hairy vetch in corn at the last cultivation, for example.

Sudan will produce at a high level on fertile, irrigated land. It can be used to advantage to provide feed when establishing pasture of perennial species, such as an alfalfa-bromegrass pasture, or in emergency situations when extra summer pasture is needed.

Silage or hay will need to be fed when the pasture is too wet, out of season, or when the pasture is in limited supply. Irrigated pasture may well provide more forage at certain periods than the livestock can eat. This surplus should be harvested as hay or silage for use at other times.

Supplemental feed in the form of dry roughage should be available at all times to livestock grazing legume-grass pastures to minimize the bloat hazard and to aid in pasture utilization. The use of such roughages to reduce the bloat hazard will be discussed later.

\(^1\) One animal unit is equivalent to a mature cow with a nursing calf.
4. Plant a mixture of recommended, high-yielding varieties of grasses and legumes.

A grass and legume mixture should be used rather than a pure stand of either for the following reasons:

- Germination and survival hazards do not affect all crops the same. Good stands are more consistently obtained from seeding a mixture than from seeding a single species.

- Mixtures of grasses and legumes yield more than any of the components grown by themselves. Legumes with grasses reduce the need for nitrogen fertilizer applications.

- There is less trouble from weeds when grasses and legumes are grown in combination. The grasses tend to fill in the bare areas between legume plants. Soil erosion is also decreased.

- The hazard of bloat from legumes is reduced by maintaining about 50 per cent grass in the pasture.

Pasture mixtures should contain only a few species of pasture plants. Each constituent of the mixture should fulfill a definite purpose. A large number of species in a mixture doesn’t necessarily assure success. Select species that are adapted to the growing season of the area and to irrigation. Avoid many of the pasture plants used for non-irrigated pastures, as they do not produce as well as many of the grasses and legumes that are suited to irrigated conditions.

Listed below are satisfactory mixtures for irrigated pastures derived from successful plantings made by Nebraska farmers. The seeding rates are based on high quality seed with good germination.

I. Smooth bromegrass
   Ranger alfalfa

<table>
<thead>
<tr>
<th>Gras/legume</th>
<th>Seed Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Smooth bromegrass</td>
<td>12 lbs.</td>
</tr>
<tr>
<td>Ranger alfalfa</td>
<td>4 lb.</td>
</tr>
<tr>
<td>Total</td>
<td>16 lb./acre</td>
</tr>
<tr>
<td>II. Bromegrass</td>
<td>8 lb.</td>
</tr>
<tr>
<td>------------------------</td>
<td>----------------</td>
</tr>
<tr>
<td>Orchard grass</td>
<td>4 lb.</td>
</tr>
<tr>
<td>Ranger alfalfa</td>
<td>4 lb.</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>16 lb./acre</strong></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>III. Smooth bromegrass</th>
<th>6 lb.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intermediate wheatgrass</td>
<td>6 lb.</td>
</tr>
<tr>
<td>Ranger alfalfa</td>
<td>4 lb.</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>16 lb./acre</strong></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>IV. Smooth bromegrass</th>
<th>3 lb.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tall fescue</td>
<td>3 lb.</td>
</tr>
<tr>
<td>Intermediate wheatgrass</td>
<td>3 lb.</td>
</tr>
<tr>
<td>Orchard grass</td>
<td>3 lb.</td>
</tr>
<tr>
<td>Ranger alfalfa</td>
<td>4 lb.</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>16 lb./acre</strong></td>
</tr>
</tbody>
</table>

In regions where the soil is highly alkaline, tall wheatgrass should be substituted for the other grasses in the mixture since it is the only one which exhibits satisfactory tolerance of such a condition.

Ladino clover is a highly nutritious forage for all classes of livestock. The addition of one-half pound of ladino clover seed to any of the pasture mixtures mentioned above may increase the nutritive value of the pasture for two or more years. Ladino clover is a shallow rooted plant and frequently dies out because of drought. Therefore, it requires frequent applications of water throughout the growing season. Maintaining a favorable moisture supply throughout the summer and fall months is particularly important. Since ladino clover cannot be distinguished from common white clover seed, it is advisable to purchase certified seed.

**Seedbed Preparation—Key to Establishment**

The success or failure of any grass and legume seeding is directly related to the amount of preparation given the seedbed. The following suggestions may aid the farmer to secure better stands:

1. Soil tests should be made prior to seedbed preparation. They will indicate the need for lime and fertilizers necessary for establishment of grasses and legumes. Lime should be applied the year prior to establishment, if needed, or applied and worked into the seedbed just prior to seeding. Phosphate fertilizer, where needed, should be applied at seeding time by band seeding with a drill at a depth of about 1½ inches.

2. Shallow plowing, diskng, or subtiling is usually more satisfactory than deep tillage since less packing will be required before seeding. A firm seedbed is necessary.

3. Plant residue cover on sloping land will reduce the hazards of erosion. The straw from small grain stubble can be worked into a suitable mulch and not interfere with uniform seeding.
4. A shallow tillage operation immediately before planting should be made to destroy weeds. Weeds compete with the desired seedlings for light, moisture, and nutrients. Therefore, weed-free seedbeds contribute to successful seedings.

5. The seedbed should be firmly packed before seeding. Care should be exercised in the packing process to assure a mellow soil. Rolling or packing while the soil is wet will result in crusted soils and poor seedbeds.

6. The surface of the field should be graded and smooth to insure uniform depth of seeding and proper distribution of irrigation water.

7. When borders are used to facilitate irrigation, they should be constructed prior to the final grading and packing.

**Planting Grasses and Legumes**

Careful consideration should be given to the following points:

1. **Method of Seeding.** Band seeding is the most satisfactory method of seeding grasses and legumes. With this method a band of fertilizer is placed approximately one inch below the seeds at the time of planting. Special drills are now available to perform this operation. Conversion kits for standard drills are also being manufactured to convert drills to the band method of seeding. Another effective method of seeding irrigated pastures is broadcasting the seed between corrugated rollers.

   On seedbeds covered with a stubble mulch, the seed should be broadcast and then a treader used to work the seed through the mulch into the soil. This is followed by cultipacking to press the soil firmly around the seeds. Often the three operations are combined into one. The seed is broadcast with a fertilizer spreader equipped with a clover seed box. The treader and roller are hitched behind the spreader and the three machines pulled with one tractor.

2. **Seeding depth** should be from \( \frac{1}{4} \) to \( \frac{3}{4} \) inch in heavy soils and \( \frac{1}{2} \) to \( \frac{3}{4} \) inches in sandy soils. *Drilling the seed too deep is a common fault* that results in poor stands. The depth regulators on the drill should be carefully adjusted to obtain optimum depth of seeding under the existing seedbed conditions.

   The soil should be firmly packed around the seeds to speed germination. This is accomplished with packer wheels on the drill or by packing with a corrugated roller following other seeding methods.

3. **Date of seeding involves two choices.** Under irrigated conditions late summer seeding will generally give the best stands of grasses and legumes. This is due primarily to the reduced competition from weeds in the fall. Successful stands can be expected from seedings made the last two weeks in August or the first week in September. Late summer seedings also allow taking a crop such as wheat or oats from the land.

   Spring seedings can be made. Early planting (prior to April 25)
is required for the seedlings to become established before the summer heat occurs. Thus, spring plantings should be made as early in the spring as the ground can be worked. It is better to risk frost injury than to lose stands from hot weather. Mixtures containing intermediate wheatgrass should not be seeded in the spring.

4. Broad-leaved weeds (except some mustards and velvet leaf) can be controlled by using \( \frac{1}{2} \) to 1 lb./A of the 2,4-D butyric acid of the ester form or 1 lb./A of the amine formulation. It is essential that the butyric form only be used on a pasture mixture containing legumes because ordinary 2,4-D will injure legumes. Best results are obtained when 2,4-D butyric is applied when the weeds are 2 to 6 inches tall. Weeds can also be controlled by clipping. Clippings should be removed if there is danger of smothering the grass-legume mixture.

5. Where wind erosion is a hazard oats or barley may be planted as a companion crop. Oats in late-summer plantings will provide protection from wind erosion during the fall and winter; they will be killed by freezing and so will not compete with the forage seedlings the following spring. The oats should be planted in widely spaced rows at right angles to the prevailing winds.

Seeding in a stubble mulch will eliminate the need for companion crops where wind erosion is likely to be serious. If a companion crop is used in a spring seeding, seed it at a reduced rate. The companion crop should be harvested for hay or silage as early as possible to reduce competition with the forage seedlings.

6. Inoculate all legumes included in pasture mixtures with the proper strain of nitrogen-fixing bacteria. These are available from commercial seed distributors. The instructions accompanying the package will state the type of legume for which each is to be used and the method to be used in applying it.

Manage Your Pasture Well

Controlled Grazing is Very Important.

Controlled grazing is an essential management practice since many legumes, alfalfa in particular, are easily damaged by continuous grazing.
Several grazing systems have been developed for obtaining highest production and for maintaining legumes in the stand.

**Rotation grazing** is neither difficult nor costly to conduct. Under this system of grazing the pasture is divided into three or more units. The livestock graze on one unit of the pasture until the forage has been properly utilized. At the end of the use period, the livestock move to another unit of the pasture. This procedure is repeated until the whole pasture has been grazed.

With proper stocking rates, this system will permit sufficient rest for each unit so that the legumes will maintain themselves satisfactorily. The length of the rest interval depends upon the rate of stocking, the degree of use and plant growth. Under proper utilization and stocking a three to four week interval is recommended.

**Strip Grazing** is a modification of rotation grazing that has been adopted by many dairymen. The size of the unit, in this case, is determined by the amount of forage the animals can consume in one day. This permits the animals to have fresh pasture each day and reduces the loss of forage by trampling that occurs in larger grazing units. Frequent rotation of grazing allowed by this system contributes to maximum forage production.

**Soiling or Green Chop Feeding.** Under this system livestock do not graze the forage at any time. Instead, the animals are confined to a dry lot and the green herbage is harvested with a forage chopper and hauled to them. The absence of trampling losses and the more uniform use of all plants in the mixture contributes to maximum forage production. In order to feed the livestock when adverse weather makes forage harvesting impossible, supplies of supplemental feed must be maintained throughout the grazing season.
Maintain the Legume in the Pasture Mixture

Many pastures in Nebraska have decreased in production because proper management practices were not utilized to help prevent the loss of the legume.

To assure the maintenance of proper proportions of legumes to grasses in a pasture:

1. **Plant the proper mixture.** Seed legumes and grasses according to the rates given on pages 5, 6. Such ratios will yield a forage consisting of approximately one half grass and one half legume.

2. **Maintain an adequate fertility level.** Adequate levels of lime, phosphorus, and potash are necessary to maintain legumes. Have your soil tested and follow the soil test recommendations. Periodic soil tests and correction of deficiencies are an integral part of the pasture management program.

3. **Practice rotation grazing.** Rotation grazing is an essential management practice for maintaining legumes in pasture mixtures. The resting period allows time for the necessary build-up of root reserves.

4. **Use mowing as a management tool with caution.** If grazing has been uneven, clipping 4-5 inches high after a use period may help in getting more uniform growth in the next period. Mowing too close or too often may have the same effect as overgrazing and result in loss of legumes or even grasses.

5. **Remove livestock from the pasture by September 10** in order to allow the legumes and grasses to grow and store food reserves before frost. *This is essential if stands are to be maintained.* Grazing may be resumed on October 20 or later.

**It Pays to Fertilize**

Grasses and legumes are as demanding upon soil nutrients as most crops that might be included in the rotation. A well balanced soil fertility program is necessary for a high level of production from irrigated pastures. Before the pasture is planted soil samples should be taken and tested to determine the amount and kind of fertilizer needed.

Lime is needed for top production of legumes in a grass-legume mixture. For best results, where soil tests show the need, lime should be applied the year before, or at least several weeks before seeding the legume and grass. Faster results will be obtained if finely ground, top quality lime is applied and mixed thoroughly with the soil by disking.

Phosphate fertilizer is often needed for maximum production of grasses and legumes. Where soil tests show phosphorus is needed, apply phosphate fertilizer at seeding time with a fertilizer attachment on the drill, or broadcast the fertilizer and disk in just before seeding.

Broadcasting phosphate fertilizer without disking or topdressing after seeding is much less effective. On established stands of grasses or legumes that are phosphorus deficient, good result can be obtained from topdressing with phosphate fertilizer in the late fall. *This is especially true where soil moisture is adequate.*
A good stand of inoculated legumes in the mixture will supply nitrogen needed for high production of both legumes and grasses. Application of nitrogen fertilizer generally will reduce nitrogen fixation by the legume and tend to eliminate the legume from the mixture.

Bromegrass and other cool-season grasses produce most of their forage in the spring and early summer and again in the fall. The release of available nitrogen by micro-organisms is slow in cold soils. Consequently, these grasses usually respond very well to nitrogen fertilizer.

Supplemental nitrogen should be applied to irrigated grass pastures each year for top forage production, if a legume is not present. The amount of available nitrogen to apply will vary from 40 to 120 pounds or more per acre, depending upon other management practices. Split applications will help provide uniform forage production throughout the grazing season. It is a common and recommended practice in Nebraska to make an early spring application and then a second application early in June of the same year. A third application in late summer may also be desirable.

Barnyard manure is a good source of essential plant nutrients. Annual applications of barnyard manure at a rate of 6 to 12 tons per acre will substantially reduce the amount of commercial fertilizer required to keep the pasture in top production.

How to Irrigate Pastures

Methods of Irrigation

There are three methods of irrigation that work well on irrigated pastures. Select the method of irrigation that fits your pasture requirements.

**Border.** Border irrigation is an efficient method of water application. Water is applied between parallel dikes commonly called borders. Borders are usually recommended on slopes of 2% or less. They need to be perfectly level from side to side. The distance between borders and the length of the border is determined by the water supply and the intake rate of the soil. This method is not recommended for soils with low intake rates.

For permanent pastures, borders 20 to 40 feet apart are often used. Streams of water must be large enough to adequately cover one strip. This method works especially well in conjunction with rotation or strip grazing of pastures.

**Sprinkler.** Sprinkler irrigation is an excellent method of applying water to pastures. It is the best method known for irrigating light textured soils or rolling areas. Sprinklers are also useful for starting new seedings. Adequate pressures as recommended by sprinkler head manufacturers must be maintained in the sprinkler line in order to insure proper droplet size that will not compact the soil surface or cover emerging plants.
Several factors should be taken into consideration when using a sprinkler system for maximum production. The depth of the root zone, the amount of soil moisture present in that zone and the soil intake rate determines how long the sprinklers will be operated at one location. Uniform application of water will be determined by sprinkler head location, nozzle size, pressures, and wind conditions.

**Corrugation.** This type of irrigation is usually used to irrigate pastures on slopes too steep for the border method and soils with low intake rates. It lends itself well for irrigating either new seedings or older established pastures.

Water is applied through siphon tubes or gated pipe into the small furrows or corrugations. Distance between furrows will depend upon the kind of soil. Since small streams only can be used, the corrugations are usually 30 inches or less apart. The area between the furrows should be wet across the surface by the time the water has filled the root zone. The length of run is usually from 300 to 660 feet depending upon the soil texture and slope.

Corrugations can be made on new seedings anytime after planting. Commercial corrugators or regular small irrigation ditching equipment with a smoothing attachment may be used. Corrugations occasionally need to be reopened.
Irrigation Facts

Sound irrigation practices will save money and increase pasture production. Keep the following facts in mind.

1. Accomplish any necessary land grading on gravity systems a year in advance. Seed to a row crop if possible the first season. Final soil smoothing operations before pasture seeding will aid good water distribution.

2. Before seeding be sure the soil profile is full of moisture to a 4-foot depth for grasses and to a 6-foot depth when mixtures of grasses and legumes are used.

3. Keep topsoil moist during germination through the young seedling stage. Frequent light applications of water by sprinkler or corrugations make this possible.

4. Wet the soil to approximately a 4-foot depth each irrigation or to the effective depth of the soil profile if soil is very shallow.

5. For top production be prepared to irrigate every 7 to 12 days. Pastures will use about \( \frac{1}{4} \) inch moisture per day, but they may use \( \frac{1}{3} \) inch per day during hot, dry weather.

6. A good way of determining when to irrigate and how much water to apply is to probe the soil and learn by feeling the sample how much moisture it contains.

7. Irrigate when 40 to 50 per cent of the available soil moisture is gone from the top 4 feet of soil.

8. Sandy soils require more frequent and lighter applications than clay soils.

9. Remove livestock before irrigating pastures and for a few days thereafter.

10. A greater than normal irrigation application in the late fall after plant growth has stopped will store moisture for the following spring and also flush undesirable salts from the soil profile. Judgment must be used in accomplishing this because leaching of nitrates may also occur.
Pasture Insects

Grasshoppers

Grasshoppers are the most important insects of Nebraska pastures. Several kinds of grasshoppers can cause severe damage to pastures when present in numbers of eight or more per square yard. Grasshoppers should be controlled in June before pastures are seriously damaged and before eggs are laid for future broods.

The following insecticides are recommended for grasshopper control:

<table>
<thead>
<tr>
<th>Insecticide</th>
<th>Amount of Actual Insecticide per Acre</th>
<th>No. of Days That Must Elapse Before Pasturing</th>
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</thead>
<tbody>
<tr>
<td>Heptachlor</td>
<td>2 to 4 ounces</td>
<td>7</td>
</tr>
<tr>
<td>Aldrin</td>
<td>2 to 4 ounces</td>
<td>21</td>
</tr>
<tr>
<td>Dieldrin</td>
<td>1 to 2 ounces</td>
<td>30</td>
</tr>
<tr>
<td>Toxaphene</td>
<td>1½ to 2 pounds</td>
<td>40</td>
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The smaller amounts are for early control, the larger amounts for late control after grasshoppers are half grown.

For most effective control apply at least three days before irrigating or after irrigating.

White Grubs

White grubs or “grub worms” may damage grass pastures by feeding on the roots, thus killing the plants. They can be detected by digging two or three inches into the soil where grass has died. Grub damage will be negligible if a good stand of legume is maintained. If present, grubs can be controlled with dry applications of aldrin, dieldrin, heptachlor, or chlordane.

Soil insecticides should be applied immediately before irrigation in order to carry the material into the soil.

Treated areas in pastures should not be grazed until the insecticide has been washed thoroughly into the soil by irrigation or rain.
What Can We Do About Livestock Bloat?

A relatively high percentage of legumes in a pasture is desirable because the legumes increase the yield, palatability, and the nutritional value of the forage. However, grazing of a legume in a pasture mixture is more likely to cause bloat than grass alone. Nevertheless, increased production of meat or milk can more than offset the hazards encountered in the grazing of an irrigated legume-grass pasture.

The bloat hazard cannot be completely prevented, but it can be reduced by observing some precautions:

1. Maintain a favorable ratio of grasses and legumes in the pasture mixture. Fifty per cent grass, evenly distributed, in a legume-grass pasture greatly reduces the bloat hazard. This can be achieved partially by a proper seeding ratio of grass to legume at the time of establishment.

2. Make sure that the animals have a full-feed of a palatable roughage such as hay or silage before turning them into a legume-grass pasture the first time. Never turn animals on a legume-grass pasture at any time when they are very hungry as they are more susceptible to bloat at this time.

3. Make dry roughage available to the livestock in the pasture. Portable feed racks filled with fair quality hay and placed where the racks are easily available to the animals at all times has proven effective in reducing the bloat hazard.

4. Provide easily accessible clean, fresh water, salt and mineral at all times for the cattle.

5. Leave the animals on the pasture day and night, rain or shine, unless the soil becomes too wet during a rainy period. Once the cattle are kept off the pasture for any length of time, make sure they have had a full-feed before turning them back into the pasture.

6. Make a practice of inspecting the cattle periodically on rainy days or when the forage is succulent and growing rapidly in early spring. Bloat generally occurs most frequently during these periods. Allow at least a three to four week interval between time of irrigation and grazing. This will permit the rapid early growth of legumes to mature somewhat before grazing takes place.

7. Dispose of easy bloaters. Some animals bloat more easily than others. Animals that are subject to chronic bloating should be replaced.
This circular is a publication of the Pasture Improvement Committee of the Nebraska College of Agriculture. It represents a revision of E.C. 55-108 “Irrigated Pastures for Nebraska” by Donald F. Burzlaff. It was revised by Donald F. Burzlaff, Deon Axthelm, William Kehr, Foster Owen, Gordon Van Riper, D. G. Hanway, Robert Roselle and Crosby Howe.

Other circulars in this series on Productive Pastures:
CC 164 Using Temporary Pastures
CC 165 Establishing Pastures in Nebraska
CC 166 Choice of Perennial Grasses for Forage Production and Erosion Control.
CC 167 How to Use Pastures
CC 168 Green Chop Feeding
CC 169 Does it Pay to Improve Your Pastures?