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EC96-142 Conservation Reserve Program: CRP Land Use Guide

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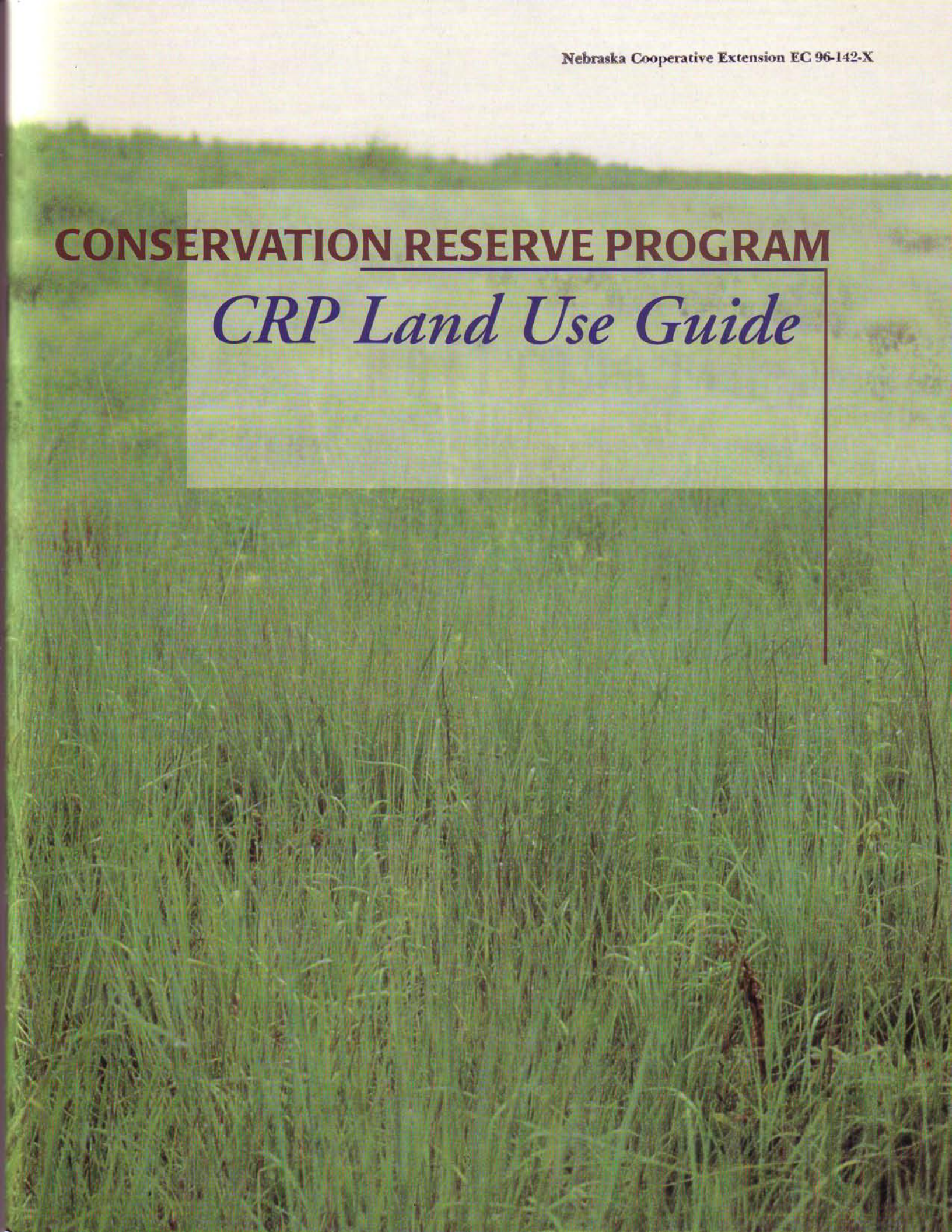
Nebraska Cooperative Extension EC 96-142-X

CONSERVATION RESERVE PROGRAM

CRP Land Use Guide



Introduction

Conservation Reserve Program (CRP) contracts held by Nebraska producers will begin to expire in 1996. Thousands of acres of grassland will be eligible for haying, grazing or to be returned to other uses. Land-use decisions made by owners and operators will impact the economic viability and long-term productivity of individual farms, as well as the region as a whole.

The intent of the *CRP Land Use Guide* is not to provide all the answers—in many instances we dont't even know the questions. It is, however, intended to provide an outline of the key issues you will face when your CRP contract expires. The guide was written by people from several different agencies. It is also a collaboration of meetings by the CRP economic committee and brain storming sessions by producers, economists and industry people.

The information contained in this guide will probably spark more questions than answers, but we hope those questions, when answered, will provide you with an economically, environmentally sound and workable plan for the future of your CRP acres. Because the needs/goals of individual producers vary and each plot of CRP land is unique, some of the recommendations, observations or regulations addressed may not apply to your particular situation. We have tried to remain general enough to at least provide a starting point for your decision.

The *CRP Land Use Guide* is also meant to point out available options, as well as some possible problems that could arise in returning grassland to crop production. It will provide a basis for you to evaluate each option from a personal perspective while considering sound ecological and economic viewpoints.

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Cover photo: CRP field in Greeley County.

CFSA program options

The future of CRP is still being considered by Congress and we will not know all the particulars until the 1995 Farm Bill has been formulated. It is hoped something will be forthcoming and rather soon. Although Congress has delayed work on CRP in favor of a more urgent farm policy bill, we do have some information for you to consider. It is possible to apply for contract extension within the last year of your contract if you include trees in your CRP acres. Therefore, if your contract was approved on or before November 28, 1990, you have the option to apply for extension of your CRP contract for up to 15 years if you include one of the following practices:

CP3A - planting of hardwood trees

CP4B - planting wildlife corridors on 30 percent of your acres. This would include the establishment of trees, shrubs, forbs, grasses and legumes

CP5A - field windbreak establishment

CP16A - shelterbelt establishment

CP19 - alley cropping (alternate trees/grass). This practice would involve a 50 percent reduction in your CRP payment.

Availability of these practices is subject to change. If you are interested in more information regarding application for CRP contract extension, please contact your local Consolidated Farm Service Agency (CFSA) office.

It is known that CRP will play a part in future policy considerations, and that there will be additional sign up periods for CRP. You, as a past contract holder, will be able to re-bid your CRP acres for future consideration. There is no penalty for past CRP acres in the re-bid process, nor are there any benefits. **Your CRP acres are not automatically accepted back into CRP.** The new re-bidding process will consider both state and national ranking factors which, in most cases, will be more restrictive and have stronger environmental quality requirements. The concern for surface and groundwater quality will play a major role in determining acres accepted into the program. Also, wildlife concerns have been added into the ranking process. The new ranking factors will change the priority of eligible acres. All acres will be eligible to re-bid. In some cases you may want to bid different acres, but the fact remains we will not be able to evaluate new proposals until Congress gives us the guidelines.

There are several things you can do to help you in this process before your contract expires. Start at your local CFSA office. Begin developing several plans a year in advance of your contract expiration. Keep the re-bidding option in mind but have alternative plans made in case your bid is not accepted or if you choose not to re-apply. Have in mind what you plan to do with the acres. If maintained in grass, you can graze, hay or re-bid. If you plan on cropping the acres, find out about the annual program requirements including your base and set aside requirements. If you plan to crop these acres you will need to contact your local Natural Resources Conservation Service (NRCS) office for a conservation plan.

USDA conservation compliance guidelines

For the last nine to 10 years, you have had land that has been under a CRP contract with the USDA. The fact that these fields qualified for CRP in the first place indicates they have some land use limitations that need to be addressed. If you are involved in agriculture and participate in the Farm Program, the following information is extremely important to your day-to-day operation. It is based on the current policy, rules and regulations as governed by the Food Security Act (FSA) of 1985 and the Food, Agriculture, Conservation and Trade Act (FACTA) of 1990. These acts apply to all persons who participate in certain USDA programs and who plant agricultural commodities on highly erodible land (HEL) or converted wetlands (CW) after December 23, 1985.

To maintain eligibility for participation in USDA programs: (1) Persons must apply an approved conservation system on all highly erodible land used to produce an agricultural commodity. (2) Persons must not plant an agricultural commodity on wetlands that were converted after December 23 , 1985, unless the wetland is exempt. In this document, we will address only the HEL provision of these acts. If you have any questions pertaining to the wetland provisions referred to here, please contact your local NRCS office.

FSA Conservation Plans

A conservation plan documents the conservation system applied or scheduled to be applied to one or more fields. The goal of the conservation plan on highly erodible fields is to reduce soil erosion to an acceptable or tolerable level for (1) the predominant HEL soil type and (2) the crop(s) intended to be used. These two factors are combined with the type of tillage, a rainfall factor and a climatic factor to determine what the estimated soil loss would be on each HEL field. A conservation system is the part of a total resource plan that provides cost-effective and practical erosion reduction based on standards contained in the NRCS Field Office Technical Guide.

Conservation Cropping Sequence

Basically, this means documenting the planned conservation cropping sequence to be used on the CRP acres in the future. A conservation cropping sequence can be as simple as continuous corn or a corn/soybean rotation or as complex as a corn/soybean/alfalfa rotation. In these cropping sequences, almost any small grain crop may be substituted for any row crop. The residue requirement for the small grain crop is usually lower than that for the row crop, but the plan is usually calculated from the most erodible sequence.

Controlling Water Erosion on Silty Soils

The critical elements for water erosion control in these types of rotations are (1) the amount of residue on the ground surface after planting this year's crop into last year's crop residue, and/or (2) controlling the length of the hillside slopes by installing terraces and contour farming according to the terraces. Planting sufficiently wide strips of perennial forages (alfalfa or native grass) between strips of annually tilled row crops (corn, soybeans, etc.) is also an option. On certain steeper soils, a combination of these may be necessary to reduce the calculated soil loss level to tolerable limits.

In extreme cases, continuous corn may require 45 to 50 percent residue cover after planting,

Typical conventional tillage methods, used prior to conversation compliance, 7 percent residue after planning.

Reduced tillage method, residue management to meet conservation compliance, 45 percent residue after planting.

without the aid of terraces and/or contouring. Terraces and contouring can potentially reduce the required residue level to 10 to 35 percent, depending on the slope lengths addressed in the field. A corn/soybean rotation may require the same 45 to 50 percent residue level, with the further stipulation that corn be no-tilled into soybean residue.

A four-year corn/soybean, four-year alfalfa rotation may only require 20 to 30 percent residue cover during the row crop years depending on the producers desire to either clean till to establish alfalfa and/or clean till to break up alfalfa. Most 50/50 combinations of corn/alfalfa rotations will have residue level requirements in this range. The corn/alfalfa rotation is seldom less than three years or more than six to eight years of each. Having less years of row crop and more years of alfalfa could potentially reduce the required residue level even further.

Controlling Wind Erosion on Sandy Soils

In areas with sandy soils, delaying the time of your first tillage in the spring can be a crucial factor in controlling wind erosion. Less exposure of bare soils to the winds in March, April and May, will mean less total erosion will occur. Also, because sandy soils do not exhibit the wet conditions normally found in silty soils, a tillage pass intended to partially dry the soil surface for planting is not normally needed.

Producers who farm these sandy soils have learned through the years that leaving residue on the surface protects the young crop from being sand blasted when spring winds blow. In sandy soils, the critical elements for wind erosion control are (1) the amount of residue on the surface after planting this year's crop into last year's crop residue, and/or (2) controlling the unprotected length of the distance across the field.

In most cases, 20 to 35 percent crop residue cover is sufficient for wind erosion protection, but silage harvesting or heavy livestock concentrations for extended periods drastically reduce the potential for having sufficient residue present after planting. Field windbreaks or permanent vegetative barriers aid in controlling wind erosion by reducing the unprotected distance across a field.

From a residue requirement standpoint, past experience indicates pivot corners planted to cane tend to be a real headache for many producers. The required residue levels are hard to attain due to the way this crop is harvested and utilized.

These pivot corners are typically used as set-aside or conserving use (CU) for pay, but the crop and residue requirements for CFSA and your FSA plan may not be the same. Each program may have different planting date and percent residue requirements. For compliance purposes, compare the two sets of requirements to ensure you are meeting the minimum requirements of the more restrictive program.

Also, please consider the crop rotation and tillage operations you have been accustomed to using in your normal farming operation. New technology in tillage and planting equipment may be easily adapted to your current equipment.

Learn how to measure crop residue on your non-HEL fields and realistically consider whether or not higher levels can be achieved and sustained on your HEL fields. The penalties for not achieving the required residue levels can be pretty steep. If the levels are not achieved in one year, expect a status review of those fields again the following year. This review can lead to further penalties.

The cropping sequence and associated residue requirement examples we have presented here are specifically relevant to the 10 county area in the central part of Nebraska. These counties, located in the Lower Loup Natural Resources District, include Loup, Boone, Custer, Garfield, Greeley, Howard, Nance, Sherman, Valley and Wheeler.

For the specific cropping and residue options and requirements in your county, contact personnel at your local NRCS office. They will provide you with information customized for your county and answer your questions concerning your cropping, tillage and residue requirements.

CONVERT to crop production

Soil Quality Considerations for CRP Conversion

Soil quality is as vital to natural resource management, agricultural sustainability and human well-being as either air and water quality. Because farmers and ranchers are stewards of the vast majority of soil in the U.S., they play a major role in maintaining and improving soil quality.

Key indicators of soil quality have been identified. Any improvement in these indicators correlates with an improvement in soil quality. Physical indicators are soil texture and water holding capacity. Chemical indicators include pH, mineral nitrogen, phosphorous and potassium, total organic carbon and nitrogen and electrical conductivity. Biological indicators include soil respiration, plant growth, mineralizable nitrogen, root depth and health, residue cover, earthworm activity and microbial population.

Soil quality can be enhanced by CRP land use. These soils generally are less dense, have greater water and air conductivity rates, increased organic matter content and improved infiltration and water holding capacity. A 10-year CRP period, however, is not long enough to return soil quality to precultivation conditions associated with native tall and short grass prairies. It is long enough, though, for land owners, operators and managers and scientists to observe and measure great improvement in soil properties. Based on this information, we know CRP has built up rather than used up the soil.

As CRP comes out of contract there are many land-use alternatives to consider. At issue here should be the maintenance of improved soil quality as a result of CRP. **Conserving soil organic matter, minimizing soil erosion utilizing renewable resources and balancing production with environmental quality concerns should all be part of the land-use equation.**

There are a number of soil quality related questions to be asked. The answers to these questions should help improve post-CRP land-use decisions.

1. What are the quantitative values of soil quality indicators on CRP and cropped land?
2. How do soil quality indicators on CRP compare to cropped land?
3. What value do you place on soil quality?
4. Do you want to degrade, maintain or improve soil quality?
5. What agricultural production practices did you use in the past that most likely contributed to the degradation of soil quality?
6. What land-use alternatives would you consider to reach your goals for soil quality?
7. If cropping CRP land is considered, what practices could be used to minimize the degradation of soil quality?
8. What tradeoffs among production, profitability, environmental quality and quality of life are you willing to accept to maintain and/or improve soil quality?

The answers to some of these questions are easy and straightforward. Others will take reflection, additional information and discussions with family and/or business partners. Most importantly, the answers to these questions will help in planning and selecting management systems for post-CRP land-use compatible with improved soil resource stewardship.

Some Tillage and Planting Consideration for Returning CRP Land to Crops

Conversion of CRP lands to cropland will offer both challenges and opportunities. After 10 years in grass cover, there will be considerable accumulation of vegetative material, both standing and on the soil surface, ranging from actively growing to completely decayed. The amount of accumulation depends on the type of cover grown. For example, research being conducted at the Northeast Research and Extension Center (NEREC), shows accumulations of approximately 4.5 tons per acre of bromegrass residue and indications show seven to 10 tons of residue per acre may be present in fields of warm-season grasses. This accumulated residue offers the potential for excellent soil erosion control, but may require additional management for proper operation of tillage and planting equipment.

Many soil properties and characteristics improve under grasslands. With appropriate management, in particular minimizing the amount of soil disturbance that occurs, the opportunity exists to prolong many of these benefits, even though the land is returned to crop production.

As with established cropland, many different tillage and planting systems can be used when returning CRP land to cropland. Selecting the most appropriate system is determined by the producer's primary objectives. For example, if the primary objective is to bury nearly all of the existing residue, then a moldboard plow system may be a suitable choice. It is, however, highly unlikely this system will meet conservation plan requirements. On the other extreme, if the objective is for minimal soil disturbance to retain many soil property improvements, no-till would be the most suitable choice.

In Nebraska, conservation typically call for after-planting residue cover levels of 20 to 50 percent. A properly managed no-till system will meet these requirements in nearly all cases. In the NEREC CRP research project, at least 80 percent residue cover remained after planting with a no-till system (knife fertilizer-application-plant), regardless of whether the existing vegetation had been mowed and removed, shredded and left on the surface or was undisturbed. Residue cover for a disk system (plow-disk-disk-knife fertilizer-harrow-plant) ranged from 9 to 25 percent, depending primarily on what was done to the residue prior to tillage operation. As expected, less than 5 percent residue cover remained for a moldboard plow system (disk-moldboard plow-disk-disk-knife fertilizer-harrow-plant).

Since much of the CRP land does not presently have an approved cropping conservation plan, this should be one of the first steps before returning land to production. Even if an approved plan was in place at the time of enrollment, the plan should be reviewed and revised to reflect current conditions and producer objectives if needed. *Natural Resources Conservation Service (NRCS) personnel anticipate a last-minute rush to develop conservation plans for land coming out of CRP. Producers are encouraged to begin plan development as soon as possible to avoid potential delays.* Remember,if conditions change plan revisions can be made at any time.

A tremendous amount of research is being conducted on CRP land throughout the country and new information and developments are continually available. Consider where the research was done, however, as something that works well in the eastern corn belt with 45 inches of rainfall may be a disaster in Nebraska with less than half that amount of moisture.

CRP Vegetation Control and Weed Management

Vegetation Control. One of the major concerns for producers wishing to return CRP land back to crop production is vegetation control. Vegetative cover on Nebraska CRP consists largely of smooth brome, wheatgrass, and/or other cool-season grasses; switchgrass; native grasses such as big bluestem, Indiangrass, etc. or mixtures of both. Although any of the above grasses may be a desirable forage, they would be considered weeds in a crop production setting. Other plant species also have invaded CRP acres. Many of these are perennial forbs such as common milkweed, hemp dogbane and field bindweed. In many fields, woody plant species have also invaded. Controlling both the vegetative cover and weeds are a concern when returning these lands to crop production.

Grass vegetation can be controlled either by deep tillage or by herbicides. Although deep tillage with a moldboard plow followed by disking may give adequate control of the vegetation, it would result in severe soil erosion and rapid deterioration of soil quality factors which CRP has increased over the last 10 years. The more environmentally-friendly alternative may be chemical control of the vegetation. A late summer herbicide application is most desirable when attempting to control switchgrass or warm-season grasses; fall application is desirable for control of smooth brome and cool season grasses. In order to obtain good control, plants must not be under drought stress at time of herbicide application in order to obtain good control. Apply to grasses with at least 6 to 8 inches of active new growth or regrowth. Perennial weed control can also be accomplished at this time. Translocating herbicides such as glyphosate (Roundup, Showoff[1], etc.), broadleaf herbicides such as dicamba (Banvel) or 2,4-D must be used in order to obtain root kill. Burning, shredding or haying of dead, standing vegetation before herbicide application may have advantages. This not only allows better coverage of green foliage, but also stimulates active regrowth.

Crop choice can indirectly affect the amount of grass vegetation control received via choice of herbicide used to control annual weeds. Corn or grain sorghum herbicides containing atrazine will aid in control of smooth brome, wheatgrass and other cool-season grasses. However, the use of a herbicide containing atrazine will not improve control with warm-season grasses. In soybeans, several post-emergence grass herbicides are available for control of grass vegetation escapes; however, little activity can be expected on established smooth brome. Limited success would be expected with other herbicides in these and other crops. The best alternative with soybeans would be Roundup Ready soybeans treated with Roundup.

Nebraska CRP Research. The NEREC has initiated research on returning CRP acreage to crop production. Primary focuses of this research include the agronomic, economic and environmental consequences of various vegetation control measures. The experiment includes three residue management (nothing, mowing, haying), three tillage (no-till, disk, plow) and four cropping system (corn-corn-corn, corn-soybean-corn, soybean-corn-soybean and sorghum-soybean-corn) treatments. All no-till and spring-disk plots received a fall application of Roundup+Banvel at 1.5 qt + 0.5 pt/A, respectively. Spray grade ammonium sulfate + non-ionic surfactant at 17 lb + 2 qt/100 gal of water were added to the mixture. Generally, 90 to 95 percent smooth brome control was obtained. Still, control was not complete; single clumps of grass emerged in the spring. These "patches" of smooth brome are potentially a serious weed problem, especially under no-till production systems. Removal of the brome also released perennial weeds such as milkweed and field bindweed and winter annuals such as prickly lettuce invaded. Therefore, in no-till plots, an additional spring application of Roundup + 2,4-D at 1 qt + 1 pt/A with spray grade ammonium sulfate and surfactant was warranted. Disk plots did not receive this application, as disking seemed to sufficiently control remaining brome vegetation. Costs of the various vegetation management strategies for this experiment are shown on Table 1.

Weed Management. Aside from the perennial grass vegetation (smooth brome, switchgrass, etc.), one could expect perennial broadleaf weeds to be a problem in returning CRP acres to crop production. In Nebraska CRP research, control of smooth brome released several perennial species, including field bindweed and milkweed. **CRP land should be scouted before late summer or fall vegetation control measures are taken to identify species and map fields.** Many perennial species may not be adequately controlled by glyphosate alone and other broadleaf herbicides may need to be added. Refer to *A Guide for Herbicide Use in Nebraska* (EC130) for further information concerning control of perennial weeds. Remember, these perennial species have been producing seed for up to 10 years. We have observed up to 10 seedling field bindweed plants/ft^2 in some research plots in the spring. Be prepared to implement control measures at planting.

Perennial broadleaf weeds. CRP gives landowners and growers an excellent opportunity to control broadleaf weeds before contracts expire. Many perennial broadleaf weeds can be controlled with herbicides in CRP, but not in the intended following crop. Refer to EC130 and NebGuide G89-905, *Weed Control on CRP Acres* (both available at your local Extension office) for more information. Be sure to follow label directions and especially note rotational restrictions with these herbicides.

[1]Use of herbicide trade names do not imply endorsement of the products mentioned.

Table 1. CRP Vegetation Control Costs[2].

Residue Management	Tillage	Operation	Costs ($)
Nothing	No-till	Fall Herbicide	$ 20.31
		Herbicide Application	3.44
		Spring Herbicide	12.80
		Herbicide Application	3.44
			39.99
	Disking	Fall Herbicide	20.31
		Herbicide Application	3.44
		Spring Disking (2X)	13.26
		Spring Harrowing	3.15
			40.16
	Plow	Spring Disk	6.63
		Spring Moldboard Plow	12.40
		Spring Disk (2X)	13.26
		Spring Harrowing	3.15
			35.44
Mowing			adds - 5.12
Haying[3] (3.47 tons/A @ $6/1000 lb bale)			adds - 41.60

[2]Costs taken from *1995 Guide for Herbicide Use in Nebraska* (EC 95-130) and from *1994 Nebraska Farm Custom Rates - Part I* (G75-207).

[3]Hay removed may have some value, but quality is generally poor.

Annual weeds. Expect a similar spectrum of annual weeds as was present before the land was enrolled in CRP. Weed seed can lie dormant for many years in the soil. **Although few summer annual weeds were noted in CRP research plots before cropping preparation, weeds such a yellow foxtail, Russian thistle, lambsquarters, PA smartweed, redroot pigweed and cocklebur readily emerged after the crop was planted.** Refer to NebGuide G86-807, *Where Do Weeds Come From?* for more information on weed seed survival in undisturbed soil. Tillage may influence weed density, and plowing and disking may bury some seed to a depth that inhibits emergence, but tillage also "plants" some weed seed. Because no-till does not "plant" the seed, weed pressure may be lower under no-till conditions. This will depend on the weed species, however. Data collected from CRP research plots indicate grassy weeds tend to be most problematic.

Crop choice and rotation. Crop choice and rotation affect weed control. For instance, if downy brome is present in CRP, wheat would not be a good crop choice as rotation to a late spring or summer crop would be an effective control for this weed. Crop choice also will usually determine herbicide options. Depending on expected weed population, one crop may have advantages over others. Crop rotation can also affect herbicide choice. For instance, atrazine or atrazine-containing herbicides may aid in controlling smooth- brome vegetation, but may prevent rotation to sensitive crops, such as soybeans.

Selecting a Crop and Rotation

Many factors should be considered when selecting a crop and rotation for former CRP land. These factors include, but are not limited to, residue management strategy, soil moisture, soil fertility, soil texture, rainfall probability, pest populations and economic analysis. Crop decisions need to be profitable and fit into multi-year planning since management practices used the first year may affect crops in subsequent rotations.

In east-central Nebraska, corn is usually the preferred crop of the region. However, other crops should be given consideration following CRP. A large amount of residue above and below the soil surface could lead to temporary immobilization of nitrogen and/or volatility losses of nitrogen from surface applications. Soybeans or alfalfa, which are nitrogen-fixing legumes, may offer an alternative to this problem. Good inoculation with *Rhizobium spp.* is critical or nitrogen deficiencies may result. Regardless of crop, soil tests should be taken to determine fertilizer needs.

Soil moisture is another problem associated with returning CRP to crop production. **Low soil moisture levels following a grass**

sod need to be addressed. Available soil moisture can be conserved by minimizing tillage operations. Each tillage pass can cause a 0.25" to 0.50" loss of water from the soil surface. Conservation tillage practices maintaining residue on the surface could minimize evaporative losses. Residue also absorbs the impact of rain droplets, lessening the likelihood of crust development and increasing water infiltration. Irregardless, a more drought-tolerant crop such as sorghum should be considered.

Other crops commonly mentioned include wheat or other small grains. CRP contracts expire on September 30 of the appropriate year, but producers may begin field preparations 90 days prior (July 1). Under dryland settings, however, this may not give sufficient time to both kill the grass sod and store sufficient moisture to allow successful fall seeding. One option is to summer-fallow the land and seed the next fall, postponing income generation for another year. The disease potential of following CRP with small grains should also be considered, as diseases such as take-all can pose serious risk to the crop. Other spring-planted crops should be given consideration.

Weed and insect management considerations may also affect crop selection. More grass vegetation control options are available in soybeans. Soil-inhabiting insects may affect one crop more than another. If chinch bug numbers are high, sorghum may not be a good choice.

Finally, second and subsequent year crop rotations should not be ignored. Residue requirements for conservation compliance, herbicide rotation restrictions, fertility needs and other factors may decide the rotation. For example, incomplete control of grass vegetation during the first crop of corn can be managed more effectively in soybeans the following year. Some herbicides used in corn may prevent this rotation, however. A summer-harvested small grain crop planted in the second year of the rotation gives opportunity for controlling perennial weeds (after harvest) not controlled in the previous spring-planted crop. **It must be stressed that decisions made following CRP must fit into a multi-year plan.**

Soil fertility considerations for land coming out of CRP

Bringing CRP land back into production should be similar to cropping previously hayed or pastured ground. Most CRP land was not fertilized and unless manure has been applied, the residual nitrate-N levels will be low. The status of the immobile nutrients phosphorus, (P), potassium (K) and zinc (Zn) can only be determined by a soil test, a process recommended when developing CRP land. University of Nebraska NebGuide G91-1000 *Guidelines for Soil Sampling* provides guidelines for sampling patterns, core numbers and sampling depths. For most CRP land, sampling the top 8 inches should be sufficient. It is important to sample areas with different cropping histories, erosion history, soil types and management practices separately so specific recommendations can be made for each area in the field.

Selection of a crop and tillage system will interact with fertilizer decisions for rate, application method and source. Land to be tilled can have fertilizer applied before the tillage operation. Tillage may also change the recommended rates of various nutrients. For example, phosphorus rates for starter application are half of broadcast rates. Broadcast phosphorus is not recommended for no-till dryland agriculture in Nebraska.

Lime: If the soil tests indicate the need for lime, then liming should be considered before the land is taken out of CRP (See NebGuide G74-153 *Understand Your Soil Test: pH - Excess Lime - Lime Needs*). Tillage decisions affect liming rates as lime must be thoroughly incorporated to work effectively. On no-till fields, avoid applying a full lime rate. Schedule lime applications to coincide with a tillage event that may be part of a conservation plan or necessary for a specific crop in a long-term rotation.

Nitrogen: The large quantity of residue that has accumulated on CRP land presents a number of challenges to producers as they contemplate returning the land to row crop production. Research with no-till has shown nitrogen broadcast on residue may result in nitrogen tie-up (immobilization) and nitrogen loss to the atmosphere (volatilization). Both these conditions can be avoided by placing the nitrogen below the residue layer. While we recommend knife application of nitrogen, we recognize application equipment will need coulters and some CRP plantings may be difficult to knife into, regardless of equipment. Nitrogen decisions for corn coming out of CRP need to

take these factors into consideration.

The increased organic matter built-up over time will begin to break down during cropping, releasing nitrogen. It is difficult to predict how much nitrogen will be released and when nitrogen release will occur during the growing season, as nitrogen release from sod is unpredictable. More total nitrogen will be released in sod composed of a legume-grass mix, compared to solid grass sods. Plowing will release much of the nitrogen by mid-season; whereas nitrogen release rate from untilled killed sod is usually much slower. However, the potential for short-term immobilization early in the season exists in both cases, so some nitrogen should be applied for early growth, probably as a row-applied starter. Determining an optimum nitrogen rate for grain crops planted to land previously in sod is complicated by the tillage method used, the type of CRP forage and the mineralization rate.

Phosphorus: Soil test results indicate if phosphorus is needed. Since little plant material was removed over the life of the CRP contract, a dramatic change in phosphorus is unlikely. Both acid or calcareous soils tend toward lower P levels over time, and 10 years is a long time. In many situations, P levels may have declined due to fixation to unavailable forms. **Starter-applied phosphorus may give the crop needed nutrients early in the season before roots reach soil phosphorus.** Broadcast phosphorus rates are higher than band applied or starter phosphorus rates. Use of starter is recommended, as both nitrogen and phosphorus can be placed near the seed for early nutrient availability. Available nutrients from residue and soil organic matter may be delayed until later in the spring and starter can provide nutrients in the interim. If soils are extremely low in phosphorus, broadcast phosphorus might be included to increase soil phosphorus levels. Row-applied phosphorus may not be sufficient for maximum yields. Attempt to build soil phosphorus levels only when soils are extremely low. Broadcast applications with the intent of increasing soil test levels should be considered only when a single, tillage year is planned. A single large phosphorus application and subsequent starter applications are recommended when tillage is planned for the first year out of CRP, followed by years of no-till.

Other Nutrients: Most Nebraska soils have adequate to very high levels of potassium. Sulfur is only a problem on coarse-textured, low-organic matter soils. Zinc deficiencies are most likely found on eroded hillsides, where land has been leveled, and on higher pH soils. Application is justified if soil tests indicate a need for these nutrients. Whenever possible, nutrient application should coincide with tillage when nutrients can be applied in bands on the surface and then incorporated with tillage.

Vegetative Management Systems: Tillage and residue management systems may interact with fertility concerns. The challenge is to get the nitrogen below the residue and evenly distributed in the soil. Tillage will allow quicker spring warm-up, and increase air exchange to speed up the breakdown of accumulated soil organic matter. However, researchers have reported that in only a few years, tillage will reverse all positive CRP effects on the soil physical properties that have accumulated in 10 years. Tillage is not the ideal solution, as it leaves the soil vulnerable to erosion.

Corn planted into sod may emerge more slowly and need more early applied nitrogen to make up for slower mineralization rates. Because they are weather dependent, the exact extent of these processes cannot be predicted.

Crop Choice: Soil fertility status may help determine crop choice. Soybeans have less need for applied nitrogen, but need to be inoculated at planting time. While soybeans have a lower phosphorus requirement, they are more sensitive to starter injury. Because soybeans are more sensitive to low pH than corn, corn may be better suited until pH levels are adjusted or acid soils. If zinc levels are low, soybeans may be better adapted since corn is more sensitive to low zinc levels. Organic matter levels also affect herbicide selection and rate.

Summary: Soil testing is the only way to accurately determine fertility status of a specific field. Nitrate-nitrogen levels will probably be low in fields coming out of CRP. Application method and timing need to fit field residue management. Be aware of potential problems associated with the chosen method and be prepared to adjust to unusual weather conditions.

Insect Management

One of the many uncertainties of bringing Conservation Reserve Program acres back into crop production is the variety of insect pests that may occur and the degree to which they may hamper production. The above-ground pest complex will not be very different than in an established cropping rotation system, with some exceptions depending on how and when the existing vegetation is removed.

Some early season damage to row crop seeds and seedlings from wireworms, seedcorn maggots, white grubs and other insects occur every year in Nebraska. These pests will also impact crops being planted into fields coming out of the CRP program. The severity and area affected will vary greatly, depending on species involved, previous vegetation and weather conditions. Traditionally, insecticides and seed treatments have been used to manage these insects, although unnecessary insurance treatments reduce the farmer's net return. Management can be improved by using monitoring traps.

Seed Attacking Insects. Wireworms, seedcorn maggots and white grubs are the most common seed and seedling-attacking insects to crops planted in fields previously in grass or pasture. Seedcorn maggots attack the seeds of many crops before or at germination, killing the newly emerging coleoptile. Damage from seedcorn maggots can be prevented by using a seed treatment.

Wireworms feed on the seeds and roots of corn, sorghum, small grains, grasses, soybeans, dry beans, sugarbeets, potatoes and various other root crops. Wireworms eat the germ of the seeds or hollow them out completely, leaving only the seed coat. Wireworm feeding may reduce seed germination or produce weak seedlings. Larvae boring into the underground (mesocotyl) portion of the stem cause seedlings to die or become stunted. Planter-box seed treatments will reduce damage to seed, but will not protect emerged plant parts. Under heavy infestations of wireworms, a granular soil insecticide may be necessary. Bait stations, consisting of germinating corn and wheat seeds may be used to assess levels of wireworm infestation before planting. Substances produced by the seedlings attract the wireworms to the bait. Bait stations should be set up two to four weeks before planting and placed randomly throughout the field with a minimum of 10 stations per field. Be sure to place stations in different parts of the field (areas with different soil types, low or high spots, etc.) to obtain a representative sample. If you find an average of one or more wireworms per bait station, use an in-furrow application of a labeled soil insecticide. If wireworms are present at low levels (less than one per station), planter-box seed treatment should be sufficient to prevent serious damage.

White grubs feed on roots deeper in the soil. Crop emergence may appear normal in the beginning. Later, the stand becomes thin or patchy. Roots of crops are usually chewed off cleanly. White grubs can only be controlled by granular soil insecticides.

The common stalk borer is another insect which may cause problems. This insect establishes itself by laying eggs on host plants in the fall. If these hosts are removed and replaced with crops in the spring and the eggs are not destroyed by tillage, the stalk borer may cause serious problems in no-till acres.

1995 CRP Results at the Northeast Center. Twenty-four wireworm bait traps were distributed throughout the CRP plot area. Only six wireworms were captured prior to planting. The decision was made to use only a seed treatment to protect the seeds. Seed treatments are low-cost alternatives to soil insecticides for seed and seedling insect control. Granular insecticides were not used because of the low wireworm count. Rootworms would not be an issue because the corn was not planted into a previous corn field. The plots were monitored for cutworms and did not require a rescue treatment. No significant stalk borer damage was observed.

For further information see NebGuides G80-501—*Corn Cutworms*, G91-1023—*Insects that Attack Seeds and Seedlings of Field Crops*, G80-521—*Stalk Borer in Corn* and EC94-1509—*Insect Management Guide for Nebraska Corn and Sorghum*.

Consider Disease Potential When Selecting Crop to Follow CRP

With millions of CRP acres being returned to cultivated crop production over the next few years, the question of disease carryover arises. Unfortunately, no research has been conducted enabling us to predict potential disease problems in cereals or legumes following CRP in Nebraska. The following assessment is based on experiences with similar cropping sequences.

In situations, where wheat was planted into a recently plowed bromegrass pasture, certain diseases, such as take-all, can pose a serious risk to the wheat. This could be a realistic threat for wheat planted into a destroyed CRP field. A wet spring may enhance take-all development in CRP, increasing the inoculum potential carried over into fall-planted wheat. Many CRP grasses also are hosts for certain wheat-attacking fungi. The root-infecting fungi that cause take-all and common crown and root rot diseases in wheat probably pose a greater threat than foliar diseases such as tan spot. In dryland wheat production, climatic conditions often do not favor foliar disease development.

The soil-borne fungus that causes take-all is common on grasses and cereals. It lives on diseased, undecomposed roots and straw. In Nebraska, it has been severe in wheat on land just broken out of native sod. **Planting other crops for two to three years between CRP and wheat will reduce, but not eliminate, the threat of take-all.** Corn and sorghum are suitable rotational crops. In some instances take-all may be severe in wheat after alfalfa or soybeans. Take-all is favored by wet, alkaline, compacted, infertile and poorly drained soils. Lime and nitrate fertilizers generally increase take-all, but ammoniacal and slow-release forms of nitrogen are less favorable for its development. Spring applications of nitrogen are less beneficial to take-all than fall applications.

Root and crown rot of winter wheat is an interrelated disease complex caused by the infection of roots and crowns and harsh winter conditions. The conditions for wheat production after CRP destruction could be favorable for root and crown rot development, particularly after a dry summer. Root and crown rot causes proportionally more damage in moisture stress situations than when moisture is adequate. If CRP acres are planted to wheat in the fall, the absence of a fallow period may lead to moisture stress, followed by early infection of the roots and crowns of the wheat seedlings. To avoid this, plant good quality wheat seed at the proper date into a firm, mellow seedbed. As an extra precaution, treat the seed with a fungicide.

Seeding wheat immediately after CRP destruction could be a recipe for disaster. A fallow period is strongly advised.

The preceding assessment of disease potential associated with returning CRP acres to cropland is based on the best available information. However, only time will tell if this threat is real. Additional references on these subjects include NebGuide G79-480 *Take-all Disease of Wheat and Grasses* and G92-1097 *Root and Crown Rot–Winterkill Complex of Winter Wheat.*

Field Research Shows Potential for Wildlife Damage in Post-CRP acres

The Conservation Reserve Program has produced nearly 1.5 million acres of exceptional habitat for wildlife in Nebraska. Unfortunately, some rodents and birds inhabiting these CRP fields damage agricultural crops. Voles, mice and ground squirrels dig up planted seeds and/or clip off emerging seedlings. Pheasants and larks pull up emerging seedlings.

There are few cost-effective methods to control wildlife in crop fields. No toxicants or repellents are registered for in-field application to reduce damage by small rodents. There is, however, commercial interest in developing a toxicant to provide cost-effective and environmentally safe protection for these situations.

Ongoing UNL research is examining the potential for damage from wildlife in acres adjacent to CRP fields or in post CRP fields. A research/demonstration project was conducted to: 1) determine the impact of rodents and birds on corn planted in bromegrass fields previously enrolled in CRP and 2) determine the efficacy of in-furrow applications of zinc phosphide for controlling rodent damage to no-till corn seed and seedlings.

This study was conducted in a strip of field corn that was no-till planted into a CRP field after the bromegrass was shredded and sprayed with a herbicide. Plots

were laid out within the area, every fourth plot was treated in-furrow at planting with a zinc phosphide rodenticide. At planting, welded wire exclosures, which would exclude rodents or birds, were strategically placed in the test field. Comparisons were made between seedlings numbers in the untreated, zinc phosphide and exclosure areas. While the differences among the treatments were not statistically significant because of high variability among the individual samples, there was as much as a 20 percent reduction in plant populations between those rows in the exclosure and those left untreated. Additional research is needed to develop methods to reduce wildlife damage in crop fields that are adjacent to CRP fields or which use conservation tillage practices.

Roles for Alfalfa When Cropping CRP

Alfalfa can be used many ways when returning CRP lands to crop production. Most ways listed below are similar to how alfalfa is used in standard crop production systems and the benefits of growing alfalfa are the same. However, a few opportunities for alfalfa use on CRP land may benefit special situations. Roles for alfalfa when cropping CRP are as follows:

1. *Use as a regular part of the crop rotation.* Alfalfa provides good, high-protein hay or silage for livestock, can be a profitable cash crop when managed and marketed properly, improves soil structure and supplies nitrogen for subsequent crops, reduces soil erosion and aids in controlling many troublesome weeds.

2. *Use as a "one-year" annual crop in the rotation.* In Nebraska, non-dormant alfalfa varieties can produce over 4 tons of hay during year of seeding from 3 cuttings if managed intensively with early planting, good weed control, sufficient moisture and timely cutting. Soil improvements and other benefits will not be as great as when alfalfa remains for multiple years but there will be some rotation benefit.

3. *Use as set-aside.*

A. *Establish during set-aside.* Avoid low- or no-yields during establishment by seeding on set-aside acres, taking payment and possibly get a late-season harvest.

B. *One-year set-aside.* When conservation crops are needed on set-aside land, alfalfa makes a good choice because the harvest option permits some lower-quality alfalfa to be fall harvested. Soils improve from using an N-fixing legume and from increased soil tilth to help increase subsequent crop yields.

C. *Multiple-year set-aside.* Since alfalfa is a perennial, the field can be used for set-aside for several years without replanting if program regulations permit.

D. *Flex acres.* Alfalfa might be used as the crop of choice on "flex acres" if program regulations permit. This may simplify cropping and rotation plans in some operations.

4. *Use as a contour strip crop.* Strips of alfalfa on the contour to both capture soil and slow runoff can reduce erosion and help meet conservation compliance by reducing the length of erosive slopes. By varying width of the alfalfa strip, uniform width strips of row crops (without point rows) might be established to permit easier use of contour row cropping with large equipment yet without the need for parallel terraces.

5. *Use for end rows, turn rows or field borders.* Alfalfa might facilitate row crop operations and provide a useful crop. If made the proper size, it also might qualify as set-aside. Fall growth could be grazed or provide a firm, non-muddy resting site for livestock grazing-associated crop residues.

6. *Control troublesome weeds.* Few plants can compete with a dense, vigorous stand of alfalfa cut several times during the growing season.

7. Kill perennial warm-season grasses that resist available herbicides when tillage is not an alternative. Alfalfa is easily interseeded and established into existing stands of warm-season grasses in early spring. By timing mowing to weaken warm-season grasses while encouraging rapid growth and canopy development of alfalfa, the stand will shade out, out compete and kill warm-season grasses after two or three production years so they will not be a problem for subsequent row crops.

8. *Interseed into cool-season grasses (and sparingly into warm-season grasses) to improve grazing or hay value.* Grass/legume combinations usually produce higher gains per animal and per acre than straight grass stands. Alfalfa can be the best legume (production and persistence) for this purpose when used in moderation and/or with proper bloat control measures.

9. *Use to maintain or transition to certified organic farming.* In Nebraska, alfalfa is the only major crop grown successfully with **no**

chemical pesticides or fertilizers. Growing alfalfa can help a site qualify for long-term chemical-free status without the production sacrifice of other crops. Plus, alfalfa provides other useful benefits mentioned earlier, such as weed control, soil nitrogen, etc.

10. *Wildlife habitat.* Alfalfa is a desired nesting and roosting site for many birds, including pheasants and a feed stuff for other wild animals (like deer). Grown in strips or blocks, alfalfa can add diversity or edge-effects to some landscapes to enhance habitat for many wildlife species.

Field Windbreaks

Field windbreaks are one means of improving crop growing conditions within a sheltered area. By altering the microclimate within a protection zone, wind speeds are reduced, greater moisture is available for crop growth, and crop yields may increase significantly.

Economic analyses conducted by Dr. James R. Brandle of the Nebraska Forest Service illustrate the value of establishing field windbreaks. Winter wheat production in eastern Nebraska, as influenced by a field windbreak, showed the yield of protected wheat exceeded that of unprotected wheat by 15 percent. The cost of windbreak establishment and the wheat production acreage lost on the areas occupied by trees was recovered in the form of increased yields per planted acre after 15 years. Beyond 15 years, there was a net gain in annual revenue. Considering a windbreak has a 50-year useful life, the producer can realize an estimated $22,000 in extra net revenue for each 160 acres protected. A separate economic analysis for a corn-soybean-wheat rotation produced a similar economic return.

Field windbreaks protect plants from physical damage. For example, research has shown young alfalfa seedlings have a low tolerance to wind and wind-blown soil and stand establishment is improved with windbreak protection.

Authors of *Windbreaks in Sustainable Agricultural Systems* explain another important benefit of field windbreaks: the opportunity for a greater diversity in crop choices. With greater crop diversity the potential to enhance the natural pest control outbreaks exists. Windbreaks contribute to greater habitat diversity, providing homes for a wider range of microbes, insects, plants and wildlife. Carefully planning and management of a field windbreak system enhances insect predation and reduces the need for pesticides.

Assistance on windbreak planning and design is available from your local Natural Resource District or NRCS office. Field windbreak establishment may entitle you to extended CRP payment benefits on the acreage planted to trees (See Tree Planting Options in the CFSA Program Options section).

Evaluate Longterm Goals and Alternatives to Single Land Use

In the next few years, several land-use options will be available to producers whose CRP contracts are expiring. Rather than return an entire field to either crop production or pastures, producers may choose to return one area to crops while maintaining another in perennial grasses.

Consider long-term land-use goals when deciding to mix uses for former CRP acres. There are likely multiple objectives to consider and weigh against potential incomes and long-term goals of the farm family and perhaps even the goals of the rural community.

Expiring CRP contracts may provide an excellent opportunity to move toward a more sustainable and environmentally sound system. Local, state and national programs may provide financial or technical assistance to landowners examining these options.

Farm plans vary based on the farmers' goals and objectives. For example, if the operator is concerned about soil erosion, the most critical aspect of the farm plan might be to leave grass established in natural waterways and/or turn rows at the ends of the fields. On the other hand, if the producer is a pheasant hunter and wants to preserve some of the wildlife benefits of the CRP program, grass areas maintained for wildlife habitat should be larger and contiguous to provide protection from predator species. Several possibilities for combined-use systems are outlined below.

Erosion control. Soil protection and erosion reduction can be achieved by farming the flat areas and leaving the most erosion-prone areas of the farm in grass. Some farm programs will make provision for this. Since there is already permanent cover on the land, most often in warm-season grasses, it is possible to establish crops on this land in alternating strips of crops and permanent

cover. Coupled with an appropriate residue management plan, this field layout can help the producer meet compliance requirements for federal feed grain programs and minimize soil loss from the cropped strips. Although narrow strips are more difficult to manage, they provide both a maximum border area of grass with crop and the best erosion reduction. Even after soybeans, soil washed down the slope in spring is caught by the field's next grass strip.

Strip cropping. Spatially diverse cropping patterns, such as strip intercropping of different crops and relay intercropping, can also intensify production and diversify fields. The advantages of strip cropping are the same as those outlined under erosion control. When the two crops are different in their growth cycles, such as small grains with soybeans or corn, the use of sunlight, water and nutrients varies and there is generally an increase in yields. Because this occurs primarily at the interface between strips, the narrower the strip the more advantage from border effects. The trade-off of course, is the increased complexity of strip field management. Even more advantage can be found with alternating strips of summer annual crops (corn, soybeans, grain sorghum) with a perennial such as alfalfa. The alfalfa strips act as a soil trap for any soil particles that wash from the row-crop strip during heavy rains.

Water quality. Surface water quality can be enhanced by planting crops on the contour, using reduced tillage and careful residue management, maintaining grassy waterways and/or planting filter strips of grass and trees along major and minor water courses near the field. Erosion and resulting chemical and fertilizer loss can be reduced by maintaining grass strips around the field to replace turn rows and open ground. These grass areas can be grazed or hayed during the appropriate season. Groundwater quality can be enhanced by not growing crops in low or especially sandy soil areas prone to leaching through the root zone. It is possible to establish or re-establish a wetland and cost share funds are available both locally and nationally to support this land use.

Grazing. Grassed fields for grazing or holding cattle can be established using fields already planted to permanent cover. A south-facing hillside left in grass is an ideal place for cattle in winter months and could be used as a holding and grazing area also in summer. This type of area could be used for spring calving if a water source is available. Investment in fencing and water equipment for cattle could make this a valuable part of the diversified landscape and an appropriate use of some areas of grass.

Wildlife. Tree planting along contours or on regular patterns for field windbreaks could enhance property values, increase crop yields in the protected areas and provide some wildlife habitat. Integrating trees throughout the field may increase equipment use complexity, but it also provides habitat for beneficial insects that can help minimize insect damage on crops and reduce chemical costs. Trees may provide income over the long term, and harvested products, such as nuts or other seeds for tree planting programs, could be an income source.

Hunting. Managed hunting habitat could increase recreation and quality of life for the farm family as well as provide a source of income if you are interested in putting together a fee hunting activity. The types of plantings for deer, wild turkeys, ducks or pheasants differ and this should be planned around the existing land forms and cover. The plants may be different if the goal is to create habitat for songbirds and migrating birds. Another potential income source would be a bed and breakfast combined with one or more of the above activities. All these options should be considered while deciding how to creatively use CRP land.

Aesthetics. Aesthetics also may be part of the long-term farm plan. Is there potential to construct ponds, wetlands or other extensive areas for wildlife habitat or recreation? What kind of diversity is desirable and how can this be combined with practical management and profitability? Many NRD and federal programs will cost share the planting of different species in your fields. Many programs also promote water and soil quality and the attempt to reduce the water runoff. Some of these ideas can be used to improve the environment, allow participation in a range of federal and local programs and make the farm a more desirable place to live.

MAINTAIN in grass

When considering land use options we suggest you take a good, long look at maintaining the land in grass. Once again, the fact that your field(s) qualified for CRP in the first place indicates serious landuse limitations that need to be addressed. While economics must be a major consideration in your decision process, you should also consider the ecological ramifications. The current stand of grass will help keep the soil in place and help to slow further degradation of the ponds, streams and rivers that lie below and downstream from the CRP acres.

Consider the wildlife benefits, as well as the possibility of lease or fee hunting as another source of income. The potential reduced tax rate, due to the land use change from cropland to grassland classification, is another added incentive to take into account.

Setting Management Goals

Setting management goals is the first step after deciding to maintain CRP contract land in grass. Well-defined goals and a realistic evaluation of your livestock, pasture and management resources will help you make and implement decisions. The following questions, which focus on important components of a forage/livestock enterprise, may help you get started.

- Are you managing to just maintain a livestock enterprise or to achieve a high level of production?
- If managing to achieve a high level of production, do you want to manage for a high level of production per animal or production per acre?
- With the addition of forage from CRP, do you anticipate increasing animal numbers?
- Will the expanded enterrise improve profitability? How soon?
- Will the expanded enterprise provide a positive cash flow? How soon?
- Do you anticipate having an abundance of pasture with the addition of forage from CRP?
- What forage species are currently in the pasture? A good mixture of native grasses? A good mixture but a thin stand or thin ground cover? An undesirable forage species or mixture?
- If the CRP forage is not currently adequate, do you want to develop productive pastures immediately or will you gradually work to higher production levels?
- Are you willing to lime and fertilize?
- Do you currently have or anticipate severe weed problems, such as thistle or brush, which must be taken care of before you intensify your system?
- Are you willing to feed supplemental grain or hay to make up pasture forage deficiencies?
- What is the condition of existing fence and is additional fencing needed?
- Are the water sources adequate for anticipated livestock numbers? Is the water located to facilitate proper grazing distribution?
- Are there adequate hay land resources for the stored winter forage needs of an expanded livestock enterprise if animal numbers are increased?
- If animal numbers are increased, will additional animals be purchased immediately or will replacement animals be produced from the existing herd over several years? Will yearlings be utilized? Will they be purchased or contracted?
- How intensive do you want your management?
- Is there adequate labor, capital and management available to accommodate the increased pasture/livestock enterprise?

Evaluating Current Vegetation

How good is your CRP land after 10 years of non-use? Some CRP fields were quickly estab-

lished with minimal cost and effort. Some were sown with second or third choice seed mixtures, due to seed shortages in the early years of the CRP. For these and other reasons many CRP fields have thin grass sods, undesired grass species or weeds and brush present. Fortunately, some have developed into dense, weed-free stands of the species that were planted.

Don't make a hasty decision and destroy the current vegetation until it has been seriously evaluated. In some cases it will be adequate to begin grazing or harvesting for hay. Other CRP vegetation may need only minor improvements to upgrade to acceptable condition.

In some situations, however, major changes or renovations will be necessary before the site can be used successfully in a forage/livestock enterprise. If you have questions about the condition or suitability of the current stand of grass on your CRP, contact your local office of the Natural Resources Conservation Service or your University of Nebraska Extension office.

Planned Grazing Systems on CRP

Applying a planned grazing system means managing grassland so it is grazed and rested in a planned sequence. This method gives the grasses a chance to regrow, compete and multiply gradually increasing the amount of high-quality grass forage available per acre.

One point must be understood for the optimum use of any grassland area; cattle, like people, are picky and choosy about what they want to eat and when they want to eat it. Imagine your pasture as a smorgasbord. Big bluestem, Indiangrass, switchgrass and sideoats grama are the prime rib, fried chicken, ham and roast beef of the pasture smorgasbord.

In a continuous grazing situation, cattle have the luxury of choosing which specific plants to graze. Cattle will walk past and over several switchgrass plants to graze the Indiangrass plant that appears to be more palatable.

The plants remaining ungrazed under continuous grazing (smorgasbord) management eventually become coarse and stemmy (less palatable). The grazed plants will produce regrowth and are again the most palatable to livestock. Continuous, season-long grazing allows livestock to repeatedly regraze the same plants preventing root regrowth and reducing plant vigor.

In a planned grazing system, the smorgasbord is subdivided into nearly equal size forage production portions. Each subdivision, or paddock, is then stocked with the entire herd for a planned number of days, versus the entire summer. This forces the cattle to eat grasses that are not necessarily their first choice because they have already been grazed short enough to be inaccessible. Each animal will be more likely to eat a third or fourth choice grass because the concentration of animals means somebody else may want that bite. With a rotational system, animals are constantly moved into paddocks with fresh, green, nutritious forage. Animal performance and grass production complement each other.

When the paddock has been grazed to the necessary extent, the cattle are moved to the next paddock. This paddock is then grazed for approximately the same number of days before cattle are moved on, and so on.

Removing the animals' ability to be so selective in what they choose to eat is vital. However, the rest period the paddock receives following grazing is the critical element. The grasses MUST have sufficient time for regrowth, to replace leaf area and restore root reserves.

A manager will cause less damage by having cattle stay in a paddock a little longer, than by moving cattle into a new paddock before it has had adequate rest/regrowth. A rule of thumb minimum rest period would be:

Grazing Period	Number of Days Rest
April 15 to June 1	20+
June 1 to July 1	30+
July 1 to October 1	60+

In the proper management of rangeland, grass must have periods of rest to recover from grazing to maintain its vigor. Root growth is closely related to forage production. Plants maintain maximum root vigor and growth when no more than half their leaves are removed at one time, either by grazing or mowing. If the plant's food-producing mechanism is depleted, leaf and root growth are adversely affected.

For example, imagine the above-ground plant as a factory and the root system as the supply line. If a major portion of the

GRAZING CALENDAR

Low Vigor Condition (20-30 days/High-Low Vigor)

Example	Days in Pasture	'96	'97	'98	'99	'00	'01
1	May 1-10 and June 1-30	A	B	C	A		
	May 11-20 and July 1-31	B	C	A	B		
	May 21-31 and August 1-31	C	A	B	C		
	Cool season grass use in all pastures. No second use of warm season species. Pastures rest 2/3 of grazing season.						
2	May 1-10, June 1-15, July 21-Aug. 9	A	B	C	A		
	May 11-20, June 16-30, August 10-31	B	C	A	B		
	May 21-31, July 1-20, September 1-20	C	A	B	C		
	Cool season grass use in all pastures. 35 days rest after first warm season species use. Pastures rest 2/3 of grazing season.						
3	May 1-7, June 1-10, July 11-26	A	B	C	D		
	May 8-15, June 11-20, July 27-Aug. 10	B	C	D	A		
	May 16-23, June 21-30, Aug. 11-25	C	D	A	B		
	May 23-31, July 1-10, Aug. 26-Sept. 9	D	A	B	C		
	Cool season use in all pastures. 30 days rest after first warm season species use. Pastures rest 3/4 of grazing season.						
4	May 1-5, June 1-6, July 7-18	A	B	C	D	E	F
	May 6-10, June 7-12, July 19-30	B	C	D	E	F	A
	May 11-15, June 13-18, July 31-Aug. 11	C	D	E	F	A	B
	May 16-20, June 19-24, Aug. 12-23	D	E	F	A	B	C
	May 21-25, June 25-30, Aug. 24-Sept. 4	E	F	A	B	C	D
	May 26-31, July 1-6, Sept. 5-16	F	A	B	C	D	E
	Cool season use in all pastures. At least 30 days rest prior to July 7 - first warm season species use. At least 60 days rest after July 7 - second warm season species use. Pastures rest 5/6 of grazing season. Rotation starts over on 7th year.						

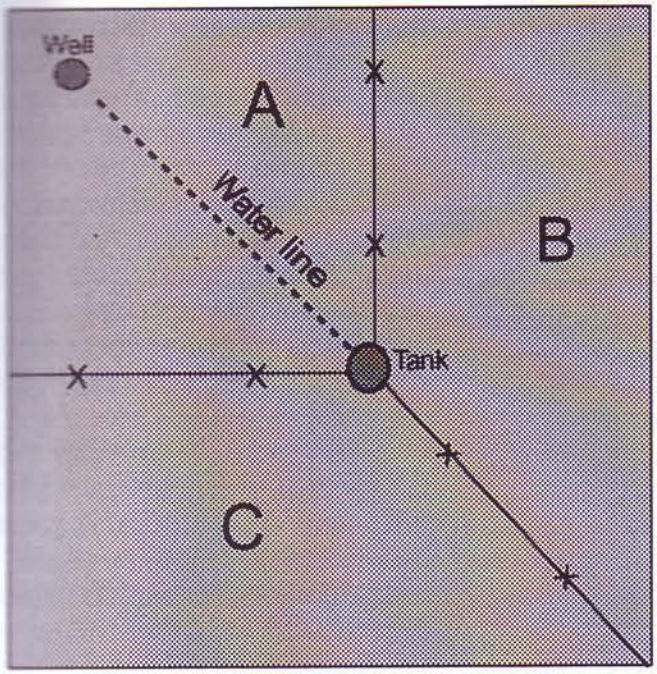
High Vigor Condition (20 % 40 days rest)

5	May 1-5, June 1-4, June 25-28, July 29-Aug 5	A	B	C	D	E	F
	May 6-10, June 5-8, June 29-July 1, Aug 6-13	B	C	D	E	F	A
	May 11-15, June 9-12, July 2-5, Aug 14-21	C	D	E	F	A	B
	May 16-20, June 13-16, July 6-13, Aug 22-29	D	E	F	A	B	C
	May 21-25, June 17-20, July 14-21, Aug 30-Sept 6	E	F	A	B	C	D
	May 26-31, June 21-24, July 21-28, Sept 7-14	F	A	B	C	D	E
	Cool season use in all pastures. At least 20 days rest prior to first warm season species use. At least 60 days rest after July 6 - second warm season species use. Pastures rest 5/6 of grazing season. Rotation starts over on 7th year.						

Exhibit 1

PLANNED GRAZING PASTURE EXAMPLES

Examples 1 and 2.



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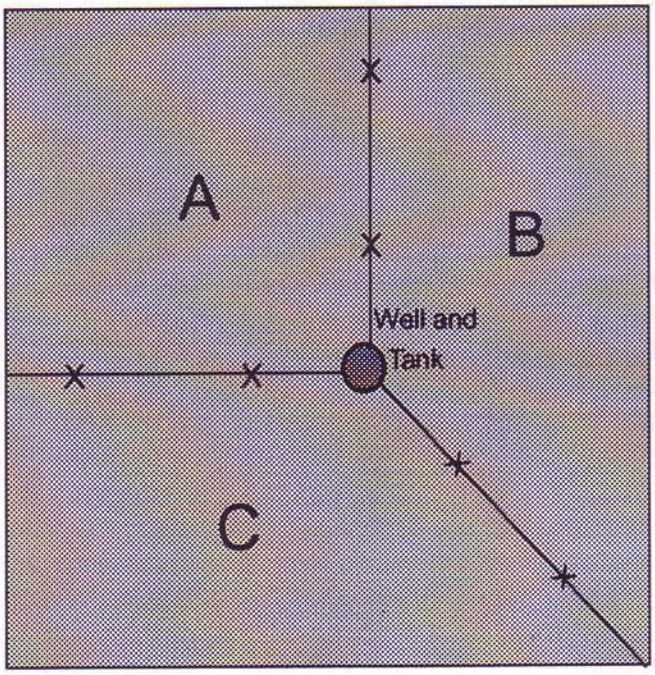
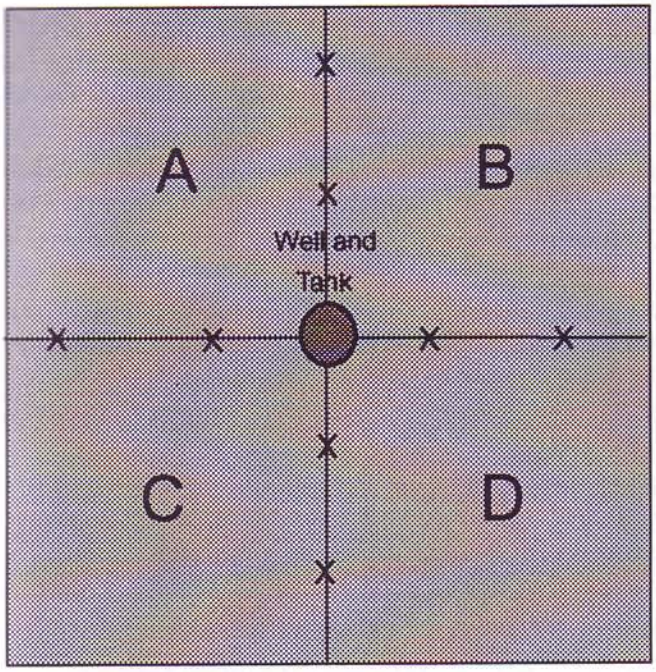
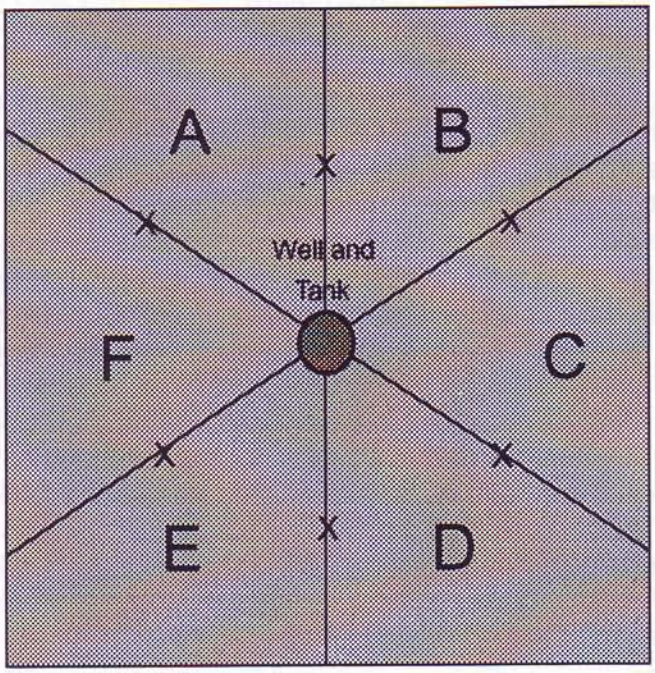


Example 3



Examples 4 and 5



RECOMMEND: 20 - 25% increase in stocking rate over season long grazing, for better distribution and increased utilization of all grass species.

Exhibit 2

factory is removed, roots will be sloughed in an effort to keep the plant alive. This, in turn, makes the plant more susceptible to drought because the root system is neither deep nor extensive. Precipitation entering the soil is accessible only until it passes beyond the deepest roots. It is then lost to the plant for the remainder of the season.

In all grasses, the amount of leaf volume removed has a direct effect on the growth of new roots. Roots are the vital supply lines of moisture and minerals to the leaves. Perennial grass plants store food in the roots after seasonal growth. They use these reserves to live on while dormant, to make the first new growth the next spring and to start new growth after green leaves and stems are clipped at any time during the growing season.

A grass plant produces twice the volume of leaves it needs to complete its growth and remain productive. Generally, when up to 50 percent of the plant is grazed in one grazing period, root growth continues unimpaired. When 60 to 90 percent of the plant is removed, however, 50 to 100 percent of the root growth is stopped and some roots and root hairs are actually sloughed off. This creates both a shallower root system and a more drought-susceptible plant. Each excessive defoliation compounds the problem.

Usually, proper or light grazing is more beneficial to plants than several years of no grazing (CRP). Generally, if a pasture is grazed three times during the growing season, up to 40 percent might be removed during the first grazing. The cattle would be utilizing mostly cool-season grass species during this time frame as warm-season grasses are still in dormancy. The second grazing might take 25 to 30 percent of the total available forage. The third grazing removes 30 to 40 percent of the total forage available. As a total, this appears to be approximately 95 to 110 percent of the total annual production.

No single grazing event should take 50 percent or more of the total forage available. With an adequate rest and regrowth period, grasses are able to replace the removed leaf area (factory) to replace root reserves and expand the root system (supply line).

To return CRP to its highest grazing potential, a grazing system should be incorporated. Basically, managing cattle to graze plants at the proper time and the right intensity will stimulate plant growth, especially desirable grasses. This managed grazing, coupled with proper resting of plants, increases the health and vigor of the more desirable grasses, allowing them to better compete with the less desirable plants for sunlight, moisture and plant nutrients. Positive changes in the grass stand will then to occur. The best adapted and most competitive grasses will begin to dominate the site once again.

When we improve the condition of grasses, we can increase livestock production, improve the habitat for wildlife, reduce erosion and conserve water. By rotating pastures, heavily grazed areas are allowed to rest, regrow and become more productive.

Combining livestock from several pastures into one herd and grazing one pasture at a time, encourages the animals to disperse, improving the grazing distribution over the whole pasture. Consolidation of the main cow herd with the replacement heifers is not very realistic as the idea is to consolidate herds compatible for breeding purposes whenever possible. Other arrangements must be made for remaining herds.

Planned grazing systems vary from ranch to ranch. The design of the system varies, due to the type of livestock, mixture of range sites and operator's objectives. The kind of system, or systems, depends upon present field layout, available water supplies and economics, as well as range condition, kinds and classes of livestock, long-range goals for CRP grassland improvement and the time necessary to supervise the operation. The point is, grass benefits greatly from the graze-rest sequence provided through properly managed planned grazing systems.

Exhibits 1 and 2 show a few examples of possible grazing calendars and fencing alignments. For more information on grass and range management, contact the local office of the U.S. Department of Agriculture's Natural Resources Conservation Service.

Switchgrass

Switchgrass, a native, warm-season grass, was planted in solid stands on many CRP acres. Native switchgrass has a poor reputation with some farmers/ranchers, who see the tall, rank clumps in their rangeland and think cows won't eat it.

However, research has shown properly-managed switchgrass it is a highly productive warm-season grass for hay production or summer grazing. Switchgrass has also been found to be a

biofuel crop which can be burned or directly converted into fuels. A common example of biofuel is ethanol production. Hopefully, CRP fields planted to switchgrass could be used for biofuel production.

Trailblazer switchgrass is a variety developed cooperatively by scientists at the University of Nebraska and USDA Agricultural Research Service. It was selected for high digestibility, producing more rapid gains in grazing livestock. Yearlings grazing Trailblazer gained an average 1.6 lb/day during a study at the Agricultural Research and Development Center near Mead, Nebraska. The Trailblazer stands being evaluated produced 306 lbs of beef per acre.

The key to switchgrass management is grazing needs to begin when the switchgrass is 12 to 14 inches tall. Stock paddocks with enough livestock to flash graze switchgrass in three to five days. Larger areas may need to be crossfenced. Move the cattle when there are six to eight inches of stubble. Rest the switchgrass until there are at least 12 to 14 inches of regrowth and then graze again to eight inches tall. Following this grazing, remove the cattle for the season.

Switchgrass should be harvested for hay in the early "boot to boot" stage, with a minimum cutting height of three inches. Switchgrass needs 30 to 45 days of regrowth before a killing frost.

Don't overlook the value of switchgrass. For more information on the benefits of switchgrass contact you local Natural Resources Conservation Service or University of Nebraska Extension office.

CRP Inventory

One of the first steps in developing a grazing plan for CRP land is a resource inventory. Assistance from your local Natural Resources Conservation Service office is available to make this inventory.

The location, kinds and amount of existing grasses should be noted. Range site(s) should be determined and a range site map helps ranchers identify potential kinds and amounts of forage production.

Range condition compares the present plant community to the potential plant community for a specific site. An experienced conservationist can determine if enough desirable plants remain to obtain improved range condition. Even a seriously mismanaged area may have enough desirable plants to re-establish the stand. If there are not enough good plants, reseeding may be needed. Many hardland CRP fields include narrow drainageways and bottomland areas with poorly established stands of native grass. Landowners should consider reseeding these areas to improve the grass stand. In most instances, silt deposition and runoff are being controlled by good grass stands on adjacent uplands. Improved erosion control allows limited tillage prior to reseeding. Landusers may also want to take advantage of herbicides labeled for CRP use only before expiration of the CRP contract. Good weed control is a vital part of grass establishment in fertile bottomland soils.

Include existing fences and water locations and potential locations for additional fences and watering facilities that could impact grazing distribution and the management of livestock on a map.

Fencing

The following items should be considered when planning to determine need, type of construction and materials.

A. Improve livestock distribution and grazing management by locating fence(s) on or near range site boundaries.

B. Separate rangeland from introduced or domesticated perennial or annual grass(es) pastures or other land uses.

C. Reduce maintenance where possible by locating fence(s) to avoid stream crossings, irregular terrain and areas of heavy snow accumulation.

D. Reduce construction costs by using suspension fences or permanent electric fences where topography of the land is level to very gently rolling or on single slope lands.

E. Reduce livestock deaths due to lightning by grounding all wires at 100 to 200 foot intervals. Do this by using steel posts or strapping pipe alongside the wooden posts. Fence wires should be securely fastened with galvanized wire ties to the posts or pipes.

F. Fence to utilize livestock watering facilities. Enclose livestock tanks in a fenced area to facilitate pasture rotation. One watering location might serve from two to 20 paddocks, depending on the system designed.

G. Facilitate handling and feeding of livestock by considering the availability to working

pens, livestock winter shelter, roads or trails.

H. Fence to exclude livestock from wildlife habitat area, livestock windbreaks and natural wetlands.

The most common fences installed are the barbed wire standard fence and the permanent electric fence. The line posts on a standard fence should be spaced approximately one rod (16.5 feet) apart when three barbed wires are used and 20 feet apart when four barbed wires are used.

Cross fencing of CRP acres is a cost effective investment. By cross fencing the area one time, you effectively double the stocking rate on those acres. Livestock that would normally graze on the entire area are now concentrated on half the total acres. Additional cross fences effectively double the stocking rate again.

Permanent electric fence is the least expensive and maintenance-free type of permanent fence to build. Livestock on corn stalks seldom test a one wire, battery powered fence, so don't discount electric fence because it's new or different and you are not yet accustomed to working with it.

Using a watering location as a central point for a number of paddocks allows the producer, with minimal effort, to move the entire herd simply by opening the gate. As the cattle come into water, they simply pass through the watering location into the next pasture designated for grazing. Cattle quickly learn this system and are readily moved with the sound of a whistle, pickup horn, caking siren, etc. They know they are moving to fresh, green forage.

Pasture tank in planned grazing system - livestock tank is located at the junction on four paddocks.

Livestock Water

Livestock need an adequate water supply. Water location has an effect on grazing. Providing an adequate water supply is essential to implementing a good management plan.

Livestock pipelines are increasingly popular as a method to convey water for livestock. At an average cost of under a dollar per foot installed, this option should be investigated if water is short in a CRP field. The location of the pipeline can be planned, designed and approved by an NRCS conservationist.

The minimum livestock tank storage should be the quantity meeting the minimum per day livestock water requirements of 12 to 15 gal/head/day for beef cattle and horses, 25 gallons for dairy cattle and 1.5 gallons for sheep and goats. The tank should provide the following storage per pasture:

Electric charge: 2 to 3 day period

Wind charge: 3 to 7 day period

Calculating Storage Requirements:

Kind of Livestock: _____

_____	x	_____	x	_____	=	_____
Number of Livestock		Days Storage Required		Requirement gal/head/day		Total Gallons Needed

EXAMPLE: Kind of Livestock: 40 cows, 3 days storage

40	x	3	x	12	=	1,440
Number of Livestock		Days Storage Required		Requirement gal/head/day		Total Gallons Needed

Finding Livestock Tank Capacity

Capacity = 23.5 x r^2 x d

r = diameter of tank ÷ 2
d = depth

Example: diameter of tank = 11 ft., depth = 2 ft.

23.5 x (5.5 x 5.5) x 2 = 1,421.75 or approx. 1,422 gal.

Tank Diameter (in feet)	Capacity @ Depth of 2 feet
8.0	752 gal.
9.0	952 gal.
10.0	1,175 gal.
11.0	1,422 gal.
20.0	4,700 gal.
30.0	10,575 gal.

Wildlife species are part of any farming/ranching operation. An inventory determines if food, cover and water are adequate for both domestic and wild animals. If not, corrective measures could become part of the management plan. The potential for various kinds of recreation could also be inventoried.

For more information on range management, contact the local office of the U.S. Department of Agriculture's Natural Resources Conservation Service.

Converting CRP to Grazingland

After several years with no grazing, your CRP land probably has heavy plant residue suppressing the growth of many grasses. This residue needs to be knocked down and broken up to open up the plant crown and recycle the accumulated nutrients tied up in the standing residue. There are three best options for making the CRP stand more productive for grazing or haying: grazing, mowing or burning.

Grazing. Grazing the CRP with livestock will be the most cost-effective way to improve and revitalize your CRP grass to prepare it for your first spring grazing. Cattle should be allowed to graze the CRP heavily during the dormant season (winter) to remove the dead grass. A minimum stocking density of 20 cow equivalents per acre is needed to provide the optimum effect of herd concentration. Stock densities of 30, 50 or even up to 100 cows per acre may be required in some situations. Use extreme caution when selecting this option on sandy soils.

The high stock density provides for more uniform grazing and trampling and manure distribution. Placing many livestock on the CRP for a brief time period, seven to 10 days, will help remove unwanted dead plant material. The manure produced by the grazing livestock will also add organic material and nutrients into the topsoil.

However, if conditions in the area where animals are concentrated become wet/muddy, the

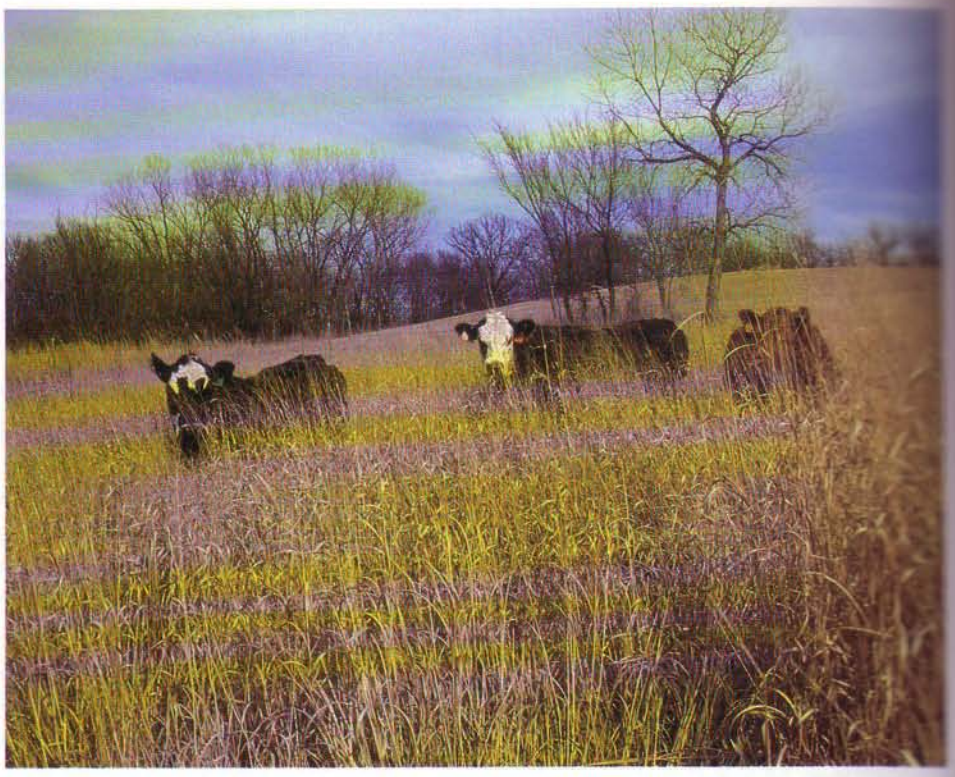
area will be damaged quickly. Grass plants will literally be trampled to death or removed from the ground from too much hoof action in wet conditions.

Using the CRP acres as calving pastures will achieve similar pasture results. The high concentration of livestock will trample the mulch into the soil and assist in the recycling of nutrients. The abundant growth on many CRP fields will provide excellent bedding and cover for new calves. This option may also allow the landowner to rest his normal calving pasture for a season.

Large CRP fields may need to be subdivided into smaller paddocks or strips to insure increased stock density. If you do not have sufficient livestock numbers within your operation, consider taking in livestock for a short period. After 10 years of CRP non-use, a one-time aggressive removal of the vegetation is not out of line. Use the location of salt and mineral and controlled feeding of hay or silage to improve and manipulate livestock distribution.

In the Sandhills, hoof action during the growing season helps firm the sandy soil. Some CRP land on sandy sites has been loosened and dried out by the activity of field mice and other burrowing wildlife. Properly managed intensive grazing will help improve the structure, fertility and moisture-holding capacity of sandy soil. Livestock hoof action also incorporates grass seed into the topsoil, creating a firm seedbed for the germination of new seedlings. Livestock impact is absolutely essential to controlling blowouts.

High livestock concentrations must be managed carefully to maintain livestock performance



High stock density grazing can remove old litter and improve grass stands.

Prescribed burn to remove excess litter from CRP field.

and insure the long-term health of the CRP grass stand. Landowners should seek range and pasture management assistance from the Natural Resources Conservation Service or University of Nebraska Cooperative Extension. Proper management and utilization of CRP grass stands will insure optimum production of forage, acceptable erosion control and improved habitat for wildlife.

Mowing. A second option for removal of dead CRP grass residue is mowing or shredding. Chopping the standing dead grass with a rotary cutter and leaving residue on the surface usually will improve the quality of hay or pasture subsequently produced on the site. Shredding the grass residue with a flail-type shredder may also improve the grass stand.

Shredding has advantages over mowing. A shredding operation cuts the grass residue into smaller segments which decompose more quickly. Shredding distributes the grass residue over the entire soil surface, also speeds decomposition. Shredding may help distribute any viable grass seeds onto thin or bare areas.

The relative effectiveness of a mowing or shredding operation depends on the height of the grass, the height of the clipping and the timing of the operation. Short clipping of a thick, tall stand of CRP grasses may tend to smother emerging shoots the following spring. The heavy mat of residue created by aggressive mowing may also delay soil warming and keep light from reaching new shoots and emerging seedlings. Faster deterioration of the dead plant residue will occur if shredding is done in the late fall and winter.

If heavy levels of residue cannot be shredded without danger of harming established grass, the residue should be removed by haying. Adequate stubble and residue levels must be maintained to control erosion especially on sandy soils. Excessive hay harvesting on a Sandhills site in the fall will encourage wind erosion throughout the winter and spring.

While not as cost-effective as intensive grazing, a properly timed mowing or shredding will improve forage production on CRP. Clipping stimulates tillering and enhances grass plant regrowth by allowing more light to reach shoots. Shredding can speed residue decomposition and distributes organic matter and grass seeds.

Burning. The third option is a prescribed burn done at the end of the dormant season or just at the time desirable grasses are beginning spring growth. Prescribed burning should only be used when and where it can be done safely and when it is used to solve problems such as control of red cedar or to reduce wildfire hazards.

Before using this tool, contact NRCS and University of Nebraska Cooperative Extension for advice and instruction for a safe and effective prescribed burn. Under certain conditions, prescribed burning is a viable and effective option for removing the old plant growth. Prescribed burning is NOT recommended on light, sandy soils.

If you are interested in burning, work with your local Extension office and NRCS field office for dates and locations of prescribed burning workshops. Know the law and your legal obligations, permits, type of equipment, clothing and personnel requirements. Burn only under the supervision of an experienced person. For more information refer to EC90-121, *Conducting a Prescribed Burn and Prescribed Burning Checklist.*

One of the benefits of a prescribed burn is that it can remove eastern red cedar (*Juniperus virginiana* L.) if their growing point is positioned in the flames at the time of the burn. Because the land has been in grass 10 years without grazing and haying, there is an ample fuel load present to get a good kill by fire of the smaller red cedar.

Assistance

As an owner or manager of CRP you can receive technical assistance from NRCS conservationists to help maintain and improve your grass. The first step is for the two of you to discuss and observe, on the land, some factors that affect your grass. These include:

1. The species of grass planted and grown on the CRP.
2. The need and capacity to divide the field by range sites (low ground from the high ground).
3. The production potential of the grass (how many cows can be stocked on the CRP field and for what length of time).

After these factors have been observed and discussed the conservationist can help prepare an inventory of your CRP including:

1. Range sites, which can be recorded on an aerial photograph
2. Range condition by range sites
3. Fences (both existing and planned)
4. Forage inventory and production potential of each CRP field
5. Location and amount of available water
6. Location of salting/mineral and feeding areas
7. Other physical features and resources
8. Noxious weed concentration

As you look at your CRP field, range management problems and opportunities usually become obvious. After identifying, the conservationist can help you consider alternatives in developing your CRP land into grazing land.

These alternatives might include proper grazing use of key plants, intensive dormant grazing on some CRP or a planned grazing system. Also, weed management (bromegrass invasion, etc.), range seeding (due to a failure of the grass to establish in an area), cross fences, additional water development, proper stocking rate and wildlife habitat improvements may be planned. You may want to consider recreation potential. All of these alternatives can be evaluated for cost effectiveness and potential for meeting your goals.

Decision

As you develop your CRP grazing plan, conservationists can help you develop tools to record your decisions, including:

1. A plan map or aerial photograph showing permanent features, range sites and condition classes
2. A list and schedule of planned treatments
3. Information used in determining your range condition
4. A forage inventory, as well as an annual grazing plan, to guide manipulation of livestock and vegetation
5. Weed and brush management plan

After you develop the plan and implement it, the role of the conservationist is to assist you with needed follow-up, such as:

1. Technical information needed to apply conservation practices (designing a pipeline, sizing a livestock tank, etc.)
2. Continued evaluation to ensure success of applied practices
3. Information about new techniques in rangeland and wildlife management (CRP burn workshops, grazing tours, range management seminars, etc.)
4. Assistance with needed changes in the range management plan as it is applied.

The role of NRCS and Cooperative Extension is to help you understand your CRP grassland and to provide the needed technical assistance to help you carry out your decisions. But YOU make all the decisions.

For more information on CRP and range management, contact the local office of the U.S. Department of Agriculture's Natural Resources Conservation Service. NRCS personnel provide technical assistance to landowners and operators to conserve natural resources on private lands.

Livestock Windbreaks

In a University of Nebraska Extension publication entitled *Windbreaks for Livestock Operations*, the authors explain that properly placed livestock windbreaks will provide substantial benefits in pastures and calving areas. Young animals in particular will benefit from wind protection during winter and early spring. When cows are protected by windbreaks, increased calving success averaging two percent has been reported by Kansas producers.

Reducing wind speed in winter lowers animal stress, improves animal health and increases feed efficiency. Researchers at Purdue University found energy requirements for cows in good condition increased 13 percent for each 10 degree drop in windchill temperature below 30 degrees. A similar study in Iowa on calves and yearlings indicated requirements for feed were 7 percent greater for those in open lots than for similar animals with shelter.

Well-designed windbreak systems collect snow in low-use areas, keeping it out of high-use areas. Windbreaks may be used to store snow where stock pond recharge or increased soil moisture is desirable. Water available during spring thaw may be managed for pasture or hay land irrigation downstream or distributed across a field to provide uniform spring soil moisture.

Planting scattered hardwood trees in pastures (10 to 20 per acre) for summer shade may provide significant benefits to livestock. It has been suggested these trees should be fenced to reduce damage to the tree where possible.

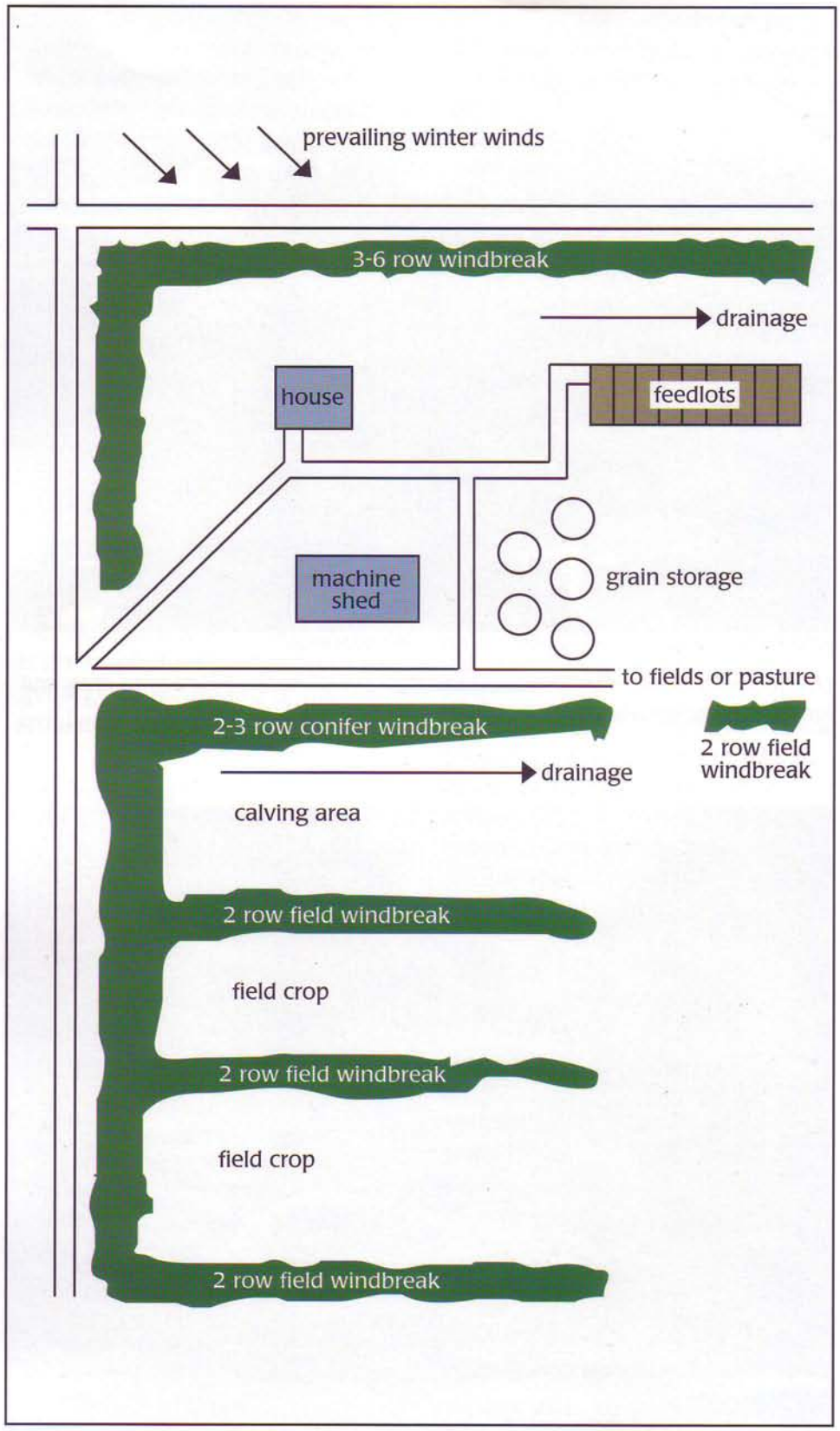
Windbreaks protect plants from

NEBRASKAland Magazine/Nebraska Game and Parks Commission photo

Livestock windbreaks help cattle maintain their overall health by lowering stress and increasing feed efficiency.

NEBRASKAland Magazine/Nebraska Game and Parks Commission photo

Cedar trees placed on the windward side will slow the wind, creating a zone of accumulation, which will protect structures or livestock from the hazards of snow and wind.



Windbreak design should be included in a total overall farm plan.

physical damage and reduce evaporation. Hay and pasture forage yields have increased by 20 percent when protected by windbreaks.

Build fences to eliminate destructive grazing when livestock have access to the windbreak area.

Assistance on windbreak planning and design is available from your local Natural Resource District or Natural Resources Conservation Service office in your area. Windbreak establishment may entitle you to extended CRP payment benefits on the acreage planted to trees (see Tree Planting Options in the CFSA Program Options Section).

Cost/Benefit Information for Windbreaks, Shelterbelts and Living Snowfences

The following example includes a typical design that could be used throughout Nebraska for all windbreak types. In areas with less than 20 inches of annual precipitation, supplemental watering or conservation mulch may be needed to help establish and maintain tree and shrub vigor. Example criteria:

- Three-row windbreak consisting of two windward rows of Eastern Red cedar and an optional third row of another conifer species.
- For cost analysis, a 3-row windbreak 900 feet long would compose one acre of land area.
- Between-row spacing is 16 feet, for an overall width of 48 feet.
- Within-row spacing in this example is; first row of red cedar, 8 feet; second row, 12 feet; and third row species option, 12 feet.

Wildlife

The long-term benefits of CRP have been many—one of the most visible is the increase in wildlife. Populations of game and non-game wildlife species rose dramatically in the decade of CRP. This population rise did not happen overnight, but was gradual as CRP acres became established. The impact is hard to assess in dollars and cents, and aesthetic benefits don't conform to a budget sheet. Media has covered the benefits to game species like pheasant or quail, but many other animals have benefitted as well. Eastern and western meadowlarks, lark sparrows, dickcissels, horned larks and others have reaped the reward of more native grass acres. Many of these species are familiar and easily found but in fact have been decreasing steadily for the past 25 years.

Some wildlife benefits are easily penciled out. Nationwide, adults in the United States annually spend over $40 billion on fishing and/or hunting. Another $18 billion is spent on bird watching and feeding or photographing wildlife. The demand for these activities is likely to increase in the future as space becomes more limited. These activities provide some opportunity for supplemental income for the family farm. For more information consult the *CRP Reference Guide* at your local Extension office.

Improving existing land for wildlife habitat may include tree planting. Designing windbreaks or group plantings of trees and shrubs for wildlife benefits will improve hunting opportunities, sustain birds that eat insect pests and add beauty and pleasure.

Establishment Costs

Site Preparation (based on average state costs) $15.00/acre

Tree Seedlings (including tax) ..... $0.48 x 262 seedlings = $125.76

Planting ..... 262 seedlings x $0.23/seedling = $60.26

Weed Control (5 years pre-emergent herbicide) $352.50

Supplemental Watering (optional)
drip system: ..... $2.15/seedling = $563.30

Fencing ..... $0.50/foot (variable depending on need)

Total Costs:
Without drip irrigation ..... $ 553.52
With drip irrigation ..... $ 1,116.82

NOTE: Available cost-share incentives significantly reduce total costs of establishment. Fencing costs to exclude livestock are variable and

NEBRASKAland Magazine/Nebraska Game and Parks Commission photo

Nongame species like the western meadowlark benefit from CRP.

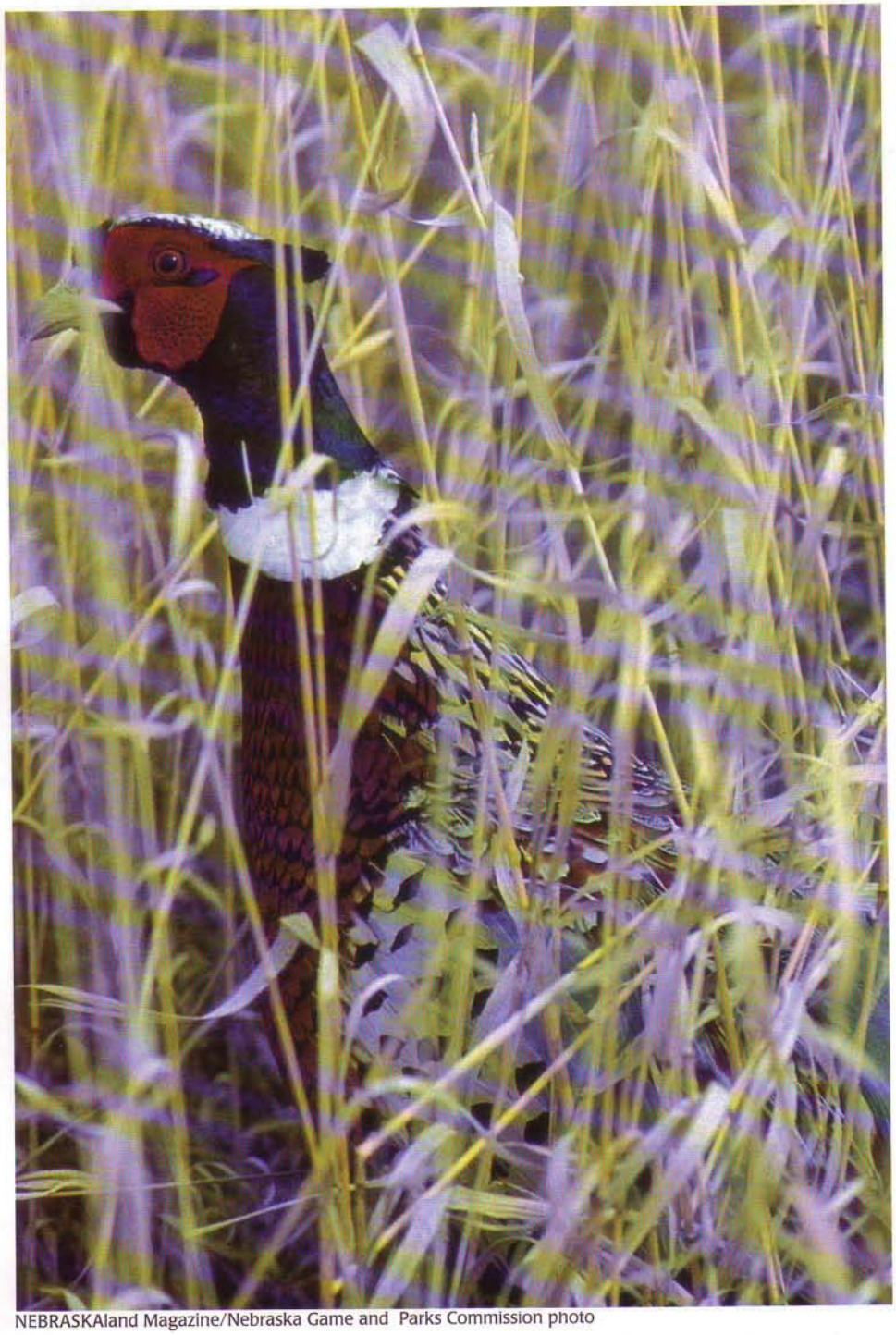
Shelterbelts provide both nesting and security cover for various wildlife species including: songbirds, squirrels, cottontail rabbits and white-tailed deer. Fruits, nuts, acorns, seeds, foliage, insects and other invertebrates are among the foods available in windbreaks. Food availability in areas near windbreaks is important for many species. Protected or nearby areas such as cornfields, with waste grain, interspersed weed seed, and insects are used by pheasants, bobwhite quail, mourning doves and other species.

Woody vegetation used to create travel lanes and other escape cover provides refuge from people and predators. Wider shelterbelts with a good vegetation layer near the ground generally offer better escape cover than do those more narrow and open.

Shelter from adverse weather conditions is a critical aspect of wildlife survival. Windbreaks help wildlife avoid wind exposure. Wildlife can find food without long exposure to energy robbing winds when it is available in or near a windbreak. The combination of wind protection, food and exposure to the sun may by the difference between life and death during winter periods.

Wildlife needs vary among areas and species. Personnel from several agencies, including the state wildlife or forestry agencies, Cooperative Extension, Natural Resources Conservation Service and the Natural Resource District are available to help with planning and design. Windbreak establishment may entitle you to extended CRP payment benefits on the acreage planted to trees. See Tree Planting Options in the CFSA Program Option Section.

There are also opportunities for cost share income from organizations like Pheasants Forever. Each county or region has a Pheasants Forever chapter. Most have money available for supporting wildlife habitat programs. Programs offered will vary from chapter to chapter. Some of the programs offered by various chapters include: nesting cover; annual rental of alfalfa acres left unharvested or ungrazed; promotion of yellow sweet clover establishment left unharvested or



NEBRASKAland Magazine/Nebraska Game and Parks Commission photo

Nebraska's number one game species thrives on abundant habits.

ungrazed; establishment of native grasses, including seed and establishment costs; improvement of existing native stands by the addition of food plots, trees or shrubs; and the establishment of trees and shrubs for windbreaks for wildlife. Annual wildlife food plots in the form of free seeds and cost share for establishment, and/or grain left standing near winter cover may also qualify for program payment. Each Pheasants Forever chapter is governed by a local board of volunteers who try to meet local habitat needs. Some of these programs may not be offered by your local chapter, but most have a habitat improvement program. The benefits to wildlife have accumulated over a decade and each Pheasants Forever chapter is willing to help preserve them. Contact a representative of your local Pheasants Forever chapter to find out what is available to you. Pheasants Forever is a non-profit organization which works under the guidelines of improving habitat for wildlife. They do not expect special privileges for cooperating in any of their programs (i.e. the right to hunt on land improved through their programs). They offer the following habitat hints to improve wildlife habitat for everyone to enjoy.

1. Manage diverted or set-aside acres for wildlife.
2. Establish grass/alfalfa field borders around fields.
3. Maintain or construct fences to keep livestock out of windbreaks.
4. Allow woody cover to become established in fence lines.
5. Leave crops unharvested next to windbreaks.
6. Don't overgraze pastures.
7. Plant a greater variety of crops.
8. Don't remove fence rows or field windbreaks.
9. Spot spray or spot mow areas for weed control.
10. Use conservation tillage or contour strip-cropping.
11. Don't mow ditches until after nesting season.
12. Don't mow or graze newly established woody cover or odd areas.
13. Minimize death loss of young pheasants by mowing alfalfa fields from the middle out.

Whatever you decide in relation to CRP land, wildlife can be included in the plans. Where CRP land will return to cropping, consider strip cropping, grass strips, grass or windbreak field edges or other practices that include wildlife habitat. Some hilly corners or similar spots may best be left in permanent cover. Vegetation providing wildlife habitat can add aesthetic beauty to a farm landscape and seeing wildlife is a fun part of farm life. Think about the unique role wildlife played in your memories of growing up in a rural area. Will current trends maintain the beauty and wonder for those growing up now and in the future?

Consider economics of land use alternatives

Even though landowners have a variety of objectives in mind when evaluating alternative uses of former Conservation Reserve Program (CRP) land, this section focuses on the profitability of land use alternatives. Several land-use alternatives are available including pasturing and haying existing or renovated stands and bringing the land into row crop production. Whether or not producers are concerned about maintaining eligibility for various USDA benefits, we assume they are interested in controlling erosion to maintain long-term productivity and land value. Since the majority of CRP acres were highly erodible, we begin with a consideration of cropping patterns reasonable on highly erodible land (HEL).

HEL Cropping Alternatives

The cropping alternatives available on HEL will depend upon rainfall area and whether wind erosion is a problem. Table 2 illustrates a set of alternative cropping and tillage systems that apply to many HEL situations. Be sure to check with your local NRCS office for modifications necessary in your area. The intensity of cropping that will be possible depends critically upon the residue that can be maintained. Because dryland yields are typically lower than irrigated yields, intensity of row crop production will be more restricted under dryland production, as illustrated in Table 2. Cropping intensity may be further restricted from that shown in Table 2 on lower productivity soils again because of problems in maintaining residue cover.

Budgeting Cropping Alternatives

After realistic cropping and tillage alternatives have been identified, cost and returns estimates can be prepared. Crop budget worksheets can be secured at your local University of Nebraska extension office. Some example budgets are provided here. Assistance in preparing budgets can also be obtained at your local extension office.

Table 2. Example HEL Cropping Alternatives

Tillage	Maximum Corn Rotation	Maximum Soybean	Residue Requirement
Conventional (shred, disk twice, apply anhydrous)	3 yrs Irrig. Corn- 3 yrs Alfalfa	None	30% after planting corn
	2 yrs dryland Corn - 6 yrs Alfalfa	None	10% after planting corn
	Note 1: Based on alfalfa established in spring with oats as nurse crop. Note 2: Need 45% residue after planting in continuous corn which isn't realistic with conventional tillage.		
Ridge till	Continuous Corn	See Note 2 below.	60% before planting
	Note 1: No more than 10% of the field can have a slope down the row exceeding 8% and must maintain a minimum 3-inch ridge to use ridge till. Note 2: Residue requirement not realistic in soybean stubble except, for example, with rye cover crop.		
No till	Continuous Corn	See Note below	45% after planting
	Note: Soybean can be included in rotation with corn if corn can be planted into 50% residue and soybeans are planted into 70% residue.		

To illustrate the budgeting process, consider the budget for producing corn following alfalfa under a pivot presented in Table 3. In the first section of the budget, each of the operations are listed along with the rate it can be completed. The number of machine hours can be calculated from the operation rate, for example, harvesting at a rate of 3 1/2 acres per hour (Operation No. 11 in Table 3) will require 1 acre divided by 3.5 acres per hour or 1/3.5 = 0.29 combine hours per acre. Adding 20 percent for additional labor time to service and adjust the combine results in an estimated 1.2 x 0.29 = 0.35 labor hours per acre. Based on a fuel consumption of 9.5 gallons per hour, the fuel requirement is 9.5 gph/3.5 acres per hour = 2.7 gallons per acre. Multiplying by the fuel price and adding 10 percent for lube results in a fuel and lube cost of 2.7 gallons x $.65 per gallon diesel x 1.1 = $1.94 per acre. Machine repair costs are more difficult to estimate. Contact your extension office for assistance in estimating the average expected repair costs per hour (or acre) for the useful life of your equipment (including irrigation equipment). The budget estimate used here for combine repairs is $26.77 per hour or $26.77 per hour/3.5 acres per hour = $7.65 per acre. The repairs for a corn head purchased new are estimated to be $0.95 per acre over 5,000 acres of lifetime use. Adding fuel and lube, power repairs and implement repairs results in a $10.54 cost per acre (Operation No. 11, Table 3). Labor costs can also be estimated for each operation or the labor requirement totaled as in this budget (2.22 hours) which is multiplied by a wage rate when totaling up per acre operating costs. Fuel, lube and repairs for pivot corn following alfalfa are shown as a subtotal of $60.45 of which $30.08 is for diesel fuel.

Materials and services are estimated in the second section of the example crop budget in Table 3. In some cases not all acres are treated. For example, second brood corn borer treatment with 1.5 pints Lorsban per acre is budgeted for one-tenth of the acres (1 year in 10) and the aerial spraying for the application of Lorsban budgeted for 0.1 acres. Totaling fuel, lube, repairs and materials and services provides an estimate of total operating costs excluding interest and unpaid labor of $155.43. Adding interest and labor costs results in total operating costs of $179.08.

Projected returns are estimated in our example both with and

Table 3. Example Crop Budget

PivotCfA

Returns Above Operating Costs Budget Worksheet
Corn Grain Pivot Irrig., Diesel, 281' Head ff Alfalfa
12 Acre inches 145 Bu Corn

Operation #	Description	Operation Rate	Hrs per Acre Labor	Hrs per Acre Mach	Cost per Acre Fuel & Lube	Cost per Acre Repairs Power	Cost per Acre Impl	SubTotal
1	Spray	11.82 Ac/hr	0.10	0.08	0.31D	0.20	0.07	0.58
2	Chisel	9.76 Ac/hr	0.12	0.10	0.56D	0.27	0.42	1.25
3	Field Cult	12.22 Ac/hr	0.10	0.08	0.45D	0.21	0.19	0.85
4	Anhy Apply	6.87 Ac/hr	0.18	0.15	0.80D	0.38	0.22	1.40
5	Disc w/Harrow	10.63 Ac/hr	0.11	0.09	0.52D	0.25	0.49	1.26
6	Plant	4.90 Ac/hr	0.24	0.20	0.89D	0.25	1.18	2.32
7	Row Crop Cult	5.29 Ac/hr	0.23	0.19	1.04D	0.50	0.28	1.82
8	Row Crop Cult	5.29 Ac/hr	0.23	0.19	1.04D	0.50	0.28	1.82
9	Irrig.	800 GPM	0.40	6.73	25.03D	11.18		36.21
10	Spray	Custom						
11	Combine	3.5 Ac/hr	0.35	0.29	1.94D	7.65	0.95	10.54
12	Cart	1750 Bu/hr	0.10	0.08	0.46D	0.22	1.50	2.18
13	Truck	Custom						
14	Auger	2500 Bu/hr	0.07	0.06	0.08D	0.11	0.02	0.21
15	Dry	Custom						
Subtotal			2.22 hrs		33.12	21.72	5.60	$60.44

Diesel 46.28 gal @ $0.65 $30.08

Materials & Services		Operation #	Units per Acre		Cost per Unit	Cost per Acre	Subtotal	Your Estimate
Seed	Corn	5	0.33	bag	79.23	26.15	$26.15	_____
Fertilizer	Anhy.N	3	45	lb. N	0.18	8.10	19.10	_____
	18-46-0	5	100	lb	0.11	11.00		
Chemicals	2,4-D ester	1	1	qt	1.69	1.69	16.98	_____
	Banvel	1	0.5	pt	9.31	4.66		
	Bicep	5	0.9	qt	8.13	7.32		
	Dipel 1/3	8	0.6125	pt	4.06	2.49		
	Lorsban 1/10	9	0.15	pt	5.57	0.84		
Custom	Aerial spray	9	0.1	ac	4.00	0.40	32.30	_____
	Truck	12	145	bu	0.12	17.40		
	Drying	14	145	bu	0.10	14.50		
Subtotal							$94.53	_____

Total Operating Costs excluding Interest & Unpaid Labor					$154.97	_____
Interest on Oper. Capital	$154.97@ 10.0% for 8 months				10.33	_____
Unpaid Labor 2.22	Hours @ $6.00/hr				13.29	_____
Total Operating Costs					$178.59	_____
Projected Returns						
	Corn	145	bu	@ $2.24	$324.80	_____
	Crop Residue	1.0	AUM	@ $10.00	10.00	_____
Total Returns					$334.80	_____
Net return above Operating Costs excluding Defic. Payment					$156.21	_____
Deficiency Payment:		$2.75	Target	$2.21 Natl Ave		
100 Bu HWY yield @				$0.54	$59.40	_____
Net Return above Operating Costs	$215.61	_____				

without deficiency payments. The deficiency payments are determined as the difference between the target price and the national average price. Over the last 10 years, Nebraska harvest prices for corn have averaged $2.24 per bushel, 3 cents per bushel above the $2.21 national average price. Using a 145 bushel average grain yield and 1.0 animal unit months grazing of corn stalks (one 1,000 pound cow for one month) results in an estimated $156.21 return above operating costs for unpaid acres. An estimated $59.40 deficiency payment for paid acres using a 110 bushel payment yield (HWY or Historical Weighted Yield) results in a net return above operating costs of $215.61 per payment acre. Note: grazing corn stalks may not be possible when seeking to meet residue requirements in which case the value of corn stalks should be omitted in the revenue calculations.

Budgeting a Rotation

To evaluate a crop rotation, a budget is needed for each year in the rotation. Example budgets for pivot and dryland crop production can be secured from your University of Nebraska Extension office. The results from budgets prepared for conventional tillage of three years of corn followed by three years of alfalfa presented in the Appendix are combined in Table 4 to provide an estimate of net returns under pivot irrigation for 150 acres. One third of the corn acres will be in first year corn each year (25 acres) and the remainder in corn following corn (50 acres). The average net per acre return above operating costs is determined in Table 4 to be $106 without farm program participation. The irrigation and tillage equipment ownership costs need also to be deducted from this return as well as the real estate taxes.

Table 4 reports a $185 per acre average annual investment to add a pivot to an existing well (a $45,000 initial investment spread over 130 acres would result in an average loan balance of approximately $185 per acre over the repayment period.) Charging 6 percent interest to represent the loan rate after adjusting for inflation and adding $2/100 personal property taxes and $24 annual depreciation per acre results in an average annual ownership cost of about $39 per acre. Similar calculations for machinery costs add another $56 per acre to the ownership costs. After subtracting real estate taxes, a net of approximately $6 remains to provide a return to management, return to the investment in the land and to pay overheads.

The farm program complicates the budgeting process. To illustrate, consider a 150 acre field accounts for 80 acres of corn base. As long as the set aside remains at 6 percent or less, half of the 150 acres (75 acres) could be planted to corn and fit with the rotation in Table 4. The set aside could be assigned to part of the oats/alfalfa establishment. A 5 percent set aside is assumed and, as a result, 4 acres of unharvested (go down) oats are included in Table 4. If 30 percent of the base is flex acres (NFA) as Congress is proposing and therefore unpaid, 24 of the 75 acres of corn would not receive deficiency, leaving 51 acres that would be paid. Contact your CFSA for assistance in determining your base, set aside, payment acres and HWY (historical weighted yield). Note: you should use an estimated deficiency payment consistent with the corn price you budget, not the CFSA estimated deficiency used to determine deficiency advances.

Adjustments for farm program participation in Table 4 include adding in deficiency payments for the 51 paid acres and adjusting the alfalfa establishment budget (PivotOats) on 4 acres (5 percent set aside) to eliminate the oats harvest and add a shredding for weed control. The net with farm program participation with a 30 percent NFA and 5 percent set aside is $24 in Table 4.

Comparing Cropping Systems

The combined budget in Table 4 provides the basis for comparing systems. The land, management and overheads (liability insurance, accounting fees, social security and income taxes, etc.) have been left to be paid from the net return. A maximum profit objective can be pursued by seeking an alternative maximize this net return. Table 5 provides a combined budget for dryland cropping based upon individual crop budgets also included in the Appendix. Continuing the assumption of 80 acres of corn base and 30 percent NFA and 5 percent set aside, the maximum payment acres is 52 acres, exceeding the 37.5 acres that would be planted following the dryland rotation of two years of corn followed by six years of alfalfa. This would result in a loss of deficiency payments if additional corn could not be planted on the rest of the farm. Base could likely be maintained by assigning alfalfa as conserving use acres.

Without farm program partici-

Table 4. Pivot Irrigated Cropping

Crop	Budget[1]	Net per Acre	Acres	$
Corn following alfalfa	PivotCfA without deficiency	$157.52	25	$3,938
Corn following corn	PivotCfC without deficiency	116.47	50	5,824
Oats/alfalfa	PivotOats	-27.96	25	-699
Alfalfa	PivotA	136.53	50	6,827
		Total	150	$15,890

Item				Net per Acre
Average net return above operating costs	$15,890/150 acres			$106
Add pivot[2]	Interest on investment $185 @ 6%	-11.10		
	Personal property taxes @ $2/100	-3.70		
	Depreciation	-24.00		-39
Machinery[2]	Interest on investment $271 @ 6%	-16.23		
	Personal property taxes @ $2/100	-5.41		
	Depreciation	-34.00		-56
Real estate taxes				-5
Net return to land and management and payment of overheads without farm program participation				$6
Adjustments to reflect farm program participation				
Corn deficiency	110 bu @ $.54/bu for 51 acres		=$3,029	
Set aside[3]				
Oats not harvested	70 bu @ $1.50/bu for 4 acres		= -420	
Harvesting costs eliminated	$22.68 for 4 acres		= +91	
Shredding added	$1.48 for 4 acres		= + 6	
		Subtotal	= $2,706	
Per acre adjustment ($2,076/150 acres)				= $18
Net return for land and management and payment of overheads with farm program participation				$24

[1]The budgets in the appendix are each uniquely labeled. For example, the pivot irrigated corn following alfalfa budget is labeled PivotCfA.

[2]Contact your University of Nebraska Extension office for assistance in estimating irrigation system and machinery costs.

[3]The operating costs for the pivot oats budget have been adjusted for set aside to exclude the harvesting costs and oats revenue and to include shredding to help control weeds.

ation, the dryland cropping system budgeted in Table 5 results in a $24 net per acre to pay land and management compared to $6 budgeted in Table 4. If additional corn can be planted on the rest of the farm, there would be no loss of deficiency from that budgeted in Table 5 and profits may be increased by substituting corn for other crops. Table 5 ignores any possible increase in corn planted on the rest of the farm and considers the case where the corn acres planted on the 150 acres are all paid deficiency resulting in a $37 net per acre, $13 per acre more than the $24 per acre budgeted in Table 4.

Budgeting Pasture Alternatives

Producing hay from existing or renovated stands can be budgeted using the same procedures followed in budgeting crop rotations. Considering pasture alternatives has some unique characteristics that will be discussed here.

Utilizing former CRP acres for pasture may include any or all of the following considerations:

1. Fencing
2. Water supply
3. Stand renovation

Similar to budgeting alternative cropping systems, each pasture management system will have its unique requirements and associated costs and returns.

To illustrate budgeting a pasture system, we will use an example for developing and managing a 160 acre pasture. Included in Table 6 is a water system and fencing to divide the quarter into four paddocks to allow simple pasture rotation. The example assumes a simple rotation system in an area where 32 cow-calf pairs could normally be carried for six months in a continuous grazing system on a quarter (5 acres per cow-calf pair). Silty clay (hard land) soil conditions are assumed. The production level assumed is 32 cow-calf pairs at 1.3 animal units per pair for six months or 250 AUM's under continuous grazing. A 20 percent increase due to the simple rotation results in an estimated 300 AUM's production (38 cow-calf pairs) for the quarter or 1.875 AUM's per acre. A rental value of $25 per month per cow-calf pair is used.

The net return per acre of $25.37 from pasture exceeds the irrigated cropland system budgeted here but falls below the dryland cropland system budgeted if farm program payments are included.

A Note on Property Taxes

The budgets presented here have reflected a change in property taxes when switching land uses. If land is reclassified from irrigated to dryland cropland or from cropland to pasture, assessed values would change. However, on a county basis, any adjustment in assessed valuation will tend to be offset by an adjustment in tax levies to meet tax needs. Particularly in counties that have considerable acres in CRP, the impact of CRP and changes in land use classification on taxes will be difficult to budget. The difference in property taxes between uses, however, would be proportional to the difference in assessed values for each land classification.

Table 5. Dryland Cropping

Crop	Budget[1]	Net per acre	Acres	$
Corn following alfalfa	DryCfA without deficiency	$84.68	18.75	$1,588
Corn following corn	DryCfC without deficiency	60.90	18.75	1,142
Oats/alfalfa	DryOats	-51.86	18.75	-972
Alfalfa	DryA	106.43	93.75	9,978
		Total	150	$11,736

				Net per acre
Average net return above operating costs	$11,736 from 150 acres		=	$78
Machinery[2]	Interest on investment $263 @ 6%	-15.80		
	Depreciation	-35.00	=	-51
Real estate taxes				-3
Net return for land and management and payment of overheads without farm program participation				$24
Adjustments to reflect farm program participation[3]				
Corn deficiency	110 bu @ $.54/bu for 37.5 acres		= $2,228	
Set aside				
Oats not harvested	50 bu @ $1.50/bu for 4 acres		= -300	
Harvesting costs eliminated	$20.23 for 4 acres		= +81	
Shredding added	$1.48 for 4 acres		= 6	
		Subtotal	$2,015	
Per acre adjustment ($2,015/150 acres)			=	$13
Net return to land and management and for payment of overheads with farm program participation				$37

[1]The budgets in the appendix are each uniquely labeled. For example, the pivot irrigated corn following alfalfa budget is labeled PivotCfA.

[2]Contact your University of Nebraska Extension office for assistance in estimating irrigation system and machinery costs.

[3]The operating costs for the pivot oats budget have been adjusted for set aside to exclude the harvesting costs and oats revenue and to include shredding to help control weeds.

Table 6. Pasture Example

Value of production: (160 acres)					Per Acre
38 cow-calf pairs for 6 months @ $25/month = $5,700					$35.60
Fencing Cost Estimate					
		Purchase Cost	Useful Life	Annual Depreciation	
Ownership Costs					
Perimeter 4-strand barbed wire 2 miles (10,560 ft) @ $0.65/foot	=	$6,864	35 years	$196.11	
Interior 2-strand HTE 1.42 miles (7,500 ft) @ $.45/foot	=	* 3,375	35 years	96.43	
Gates 4 steel gates @ $50	=	200	40 years	5.00	
Energizer		* 300	15 years	20.00	
Total		$10,739		$317.54	
Subject to personal property tax		* $3,675		$116.43	
Total Annual Depreciation Costs per acre $318/160 acres				=	$1.98
Annual interest costs = average annual investment x interest rate					
$\frac{\$10,739 + 318}{2}$ x 6%/100	=			331.71	2.07
Annual Personal Property Tax per Acre = Average annual investment subject to PP tax x (tax rate/100) =					
$\frac{\$3,675 + 116}{2}$ $2/100 = $37.91					0.24
Repair Costs 2 miles @ $42/mile/year				$84.00	$.53
Energy Costs 30 kwh/month x 6 months @ $.0935/kwh				$16.83	.11
Total annual fencing costs per acre =					$4.93

Table 6. Pasture Example (continued)

Water System Cost Estimate

Ownership Costs		Purchase Cost	Useful Life	Annual Depreciation
Well, 200 foot		$1,600	25 years	$64.00
PVC pipe (buried, 1,320ft)		1,320	20 years	66.00
Pump (1 hp)	*	680	18 years	37.78
Pressure Tank	*	820	20 years	41.00
Steel Tanks, (11 foot)	*	360	15 years	24.00
Tank Float and valve	*	30	5 years	6.00
Electrical Service		300	50 years	6.00
Total		5110		$244.78
Subject to personal property tax	*	$1,890		$108.78

		Per Acre
Total Annual Depreciation Costs per acre $245/160 acres		$1.53
Annual Interest Costs = Average annual investment X interest rate =		
$\frac{\$5,110 + 245}{2}$ x 6%/100 = $160.65 =1.00		
Annual Personal Property Tax per acre = Average annual investment subject to personal property tax x (tax rate/100) =		
$\frac{\$1,890 \times 109}{2}$ x $2/100 = $20.00		0.13
Pumping Costs		
38 cow/calf pairs x 15 gals/day x 180 days = 102,600 gals		
7 gals/minute for 244 hrs @ 1.5 kw/hr = 366 kwh @ $.0935/kwh =	$34.22	.21
Repair costs, 244 hours @ $.07/hr =	$17.08	.11
Meter charge $8.50/month x 6 months =	$51.00	
Total Annual pumping costs per acre		0.32
		$3.30
Real estate taxes		2.00
Net return to land, management, and to pay overheads		$25.37

Notes

PivotCfA

Returns Above Operating Costs Budget Worksheet
Corn Grain Pivot irrig, Diesel,281' Head ff Alfalfa
12 Acre-inches 145 Bu Corn

Operation #	Description	Operation Rate		Hrs per Acre Labor	Hrs per Acre Mach	Cost per Acre Fuel & Lube	Repairs Power	Repairs Impl	Sub-Total	Your Estimate
1	Spray	11.82	Ac/hr	0.10	0.08	0.31D	0.20	0.07	0.58	_____
2	Chisel	9.76	Ac/hr	0.12	0.10	0.56D	0.27	0.42	1.25	_____
3	Field Cult	12.22	Ac/hr	0.10	0.08	0.45D	0.21	0.19	0.85	_____
4	Anhy. Apply	6.87	Ac/hr	0.18	0.15	0.80D	0.38	0.22	1.40	_____
5	Disc w/Harrow	10.63	Ac/hr	0.11	0.09	0.52D	0.25	0.49	1.26	_____
6	Plant	4.9	Ac/hr	0.24	0.20	0.89D	0.25	1.18	2.32	_____
7	Row Crop Cult.	5.29	Ac/hr	0.23	0.19	1.04D	0.50	0.28	1.82	_____
8	Row Crop Cult.	5.29	Ac/hr	0.23	0.19	1.04D	0.50	0.28	1.82	_____
9	Irrig.	800	GPM	0.40	6.73	25.03D	11.18		36.21	_____
10	Spray	Custom								
11	Combine	3.5	Ac/hr	0.35	0.29	1.94D	7.65	0.95	10.54	_____
12	Cart	1750	Bu/hr	0.10	0.08	0.46D	0.22	1.50	2.18	_____
13	Truck	Custom								
14	Auger	2500	Bu/hr	0.07	0.06	0.08D	0.11	0.02	0.21	_____
15	Dry	Custom								
Subtotal				2.22 Hrs		33.12	21.72	5.60	$60.44	_____

Diesel 46.28 Gal @ $0.65 $30.08

Materials & Services		Operation #	Units per Acre		Cost per Unit	Cost per Acre	Sub-Total	Your Estimate
Seed	Corn	5	0.33	bag	79.23	26.15	$26.15	_____
Fertilizer	Anhy. N	3	45	lb. N	0.18	8.10	19.10	_____
	18-46-0	5	100	lb	0.11	11.00		
Chemicals	2,4D ester	1	1	qt	1.69	1.69	16.98	_____
	Banvel	1	0.5	pt	9.31	4.66		
	Bicep	5	0.9	qt	8.13	7.32		
	Dipel 1/3	8	0.6125	pt	4.06	2.49		
	Lorsban 1/10	9	0.15	pt	5.57	0.84		
Custom	Aerial spray	9	0.1	ac	4.00	0.40	32.30	_____
	Truck	12	145	bu	0.12	17.40		
	Drying	14	145	bu	0.10	14.50		
Subtotal							$94.53	_____
Total Operating Costs excluding Interest & Unpaid Labor							$154.97	
Interest on Oper. Capital		$154.97 @ 10.0% for 8 Months					10.33	_____
Unpaid Labor		2.22 Hours $6.00 /hr					13.29	_____
Total Operating Costs							$178.59	_____
Projected Returns								
	Corn		145	Bu	@ $2.24		$324.80	_____
	Crop Residue		1	AUM@ $10.00			10.00	_____
Total Returns							$334.80	_____
Net Return above Operating Costs excluding defic. payment							$156.21	_____
Deficiency Payment:			$2.75	Target	$2.21 Nat'l Ave			
110	Bu HWY yield @				$0.54		$59.40	_____
Net Return above Operating Costs							$215.61	_____

PivotCfC

Returns Above Operating Costs Budget Worksheet

Corn Grain. Pivot Irrig, Diesel,281' Head ff Corn

12 Acre-inches 135 Bu Corn

Operation #	Description	Operation Rate		Hrs per Acre Labor	Hrs per Acre Mach	Cost per Acre Fuel & Lube	Cost per Acre Repairs Power	Cost per Acre Repairs Impl	Cost per Acre Sub-Total	Your Estimate
1	Shred	7.73	Ac/hr	0.16	0.13	0.71D	0.34	0.43	1.48	_____
2	Disc w/Harrow	10.63	Ac/hr	0.11	0.09	0.52D	0.25	0.49	1.26	_____
3	Anhy. Apply	6.87	Ac/hr	0.18	0.15	0.80D	0.38	0.22	1.40	_____
4	Disc w/Harrow	10.63	Ac/hr	0.11	0.09	0.52D	0.25	0.49	1.26	_____
5	Plant	4.9	Ac/hr	0.24	0.20	0.89D	0.25	1.18	2.32	_____
6	Row Crop Cult.	5.29	Ac/hr	0.23	0.19	1.04D	0.50	0.28	1.82	_____
7	Row Crop Cult.	5.29	Ac/hr	0.23	0.19	1.04D	0.50	0.28	1.82	_____
8	Irrig.	800	GPM	0.40	6.73	25.03D	11.18		36.21	_____
9	Spray	Custom								
10	Combine	3.5	Ac/hr	0.35	0.29	l.94D	7.65	0.95	10.54	_____
11	Cart	1750	Bu/hr	0.10	0.08	0.42D	0.20	1.50	2.12	_____
12	Truck	Custom								
13	Auger	2500	Bu/hr	0.06	0.05	0.08D	0.10	0.02	0.20	
14	Dry	Custom								
Subtotal				2.16 Hrs		32.99	21.60	5.84	$60.43	_____
	Diesel	46.16	Gal @ $0.65 $30.00							

Materials & Services		Operation #	Units per Acre		Cost per Unit	Cost per Acre	Sub-Total	Your Estimate
Seed	Corn	5	0.33	bag	79.23	26.15	$26.15	_____
Fertilizer	Anhy. N	3	145	lb. N	0.18	26.10	37.10	_____
	18-46-0	5	100	lb	0.11	11.00		
Chemicals	Bicep	5	0.9	qt	8.13	7.32	17.78	_____
	Counter 1/2	5	4.356	lb	1.64	7.14		
	Dipel 1/3	8	0.6125	pt	4.06	2.49		
	Lorsban 1/10	9	0.15	pt	5.57	0.84		
Custom	Aerial spray	9	0.1	ac	4.00	0.40	30.10	_____
	Truck	12	135	bu	0.12	16.20		
	Drying	14	135	bu	0.10	13.50		
Subtotal							$111.13	_____
Total Operating Costs excluding interest & Unpaid Labor							$171.56	_____
Interest on Oper. Capital			$171.56	@ 10.0%for 8 Months			11.44	_____
Unpaid Labor			2.16	Hours $6.00 /hr			12.93	_____
Total Operating Costs							$195.93	
Projected Returns								
	Corn		135	Bu @ $2.24			$302.40	_____
	Crop Residue		1	AUM @ $10.00			10.00	_____
Total Returns							$312.40	
Net Return above Operating Costs excluding defic. payment							116.47	
Deficiency Payment:			$2.75	Target $2.21 Nat'l Ave				
110 Bu HWY yield @			$0.54				$59.40	_____
Net Return above Operating Costs							$175.87	_____

PivotOats

Returns Above Operating Costs Budget Worksheet
Oats With Spring Alfalfa Seeding
1 Acre-inches 70 Bu Oats

Operation #	Description	Operation Rate		Hrs per Acre Labor	Hrs per Acre Mach	Cost per Acre Fuel & Lube	Repairs Power	Repairs Impl	Sub-Total	Your Estimate
1	Spread Fert.	Custom								
2	Disc w/Harrow	7.8	Ac/hr	0.16	0.13	0.71D	0.34	0.53	1.58	_____
3	Drill	5.4	Ac/hr	0.23	0.19	0.81D	0.23	0.95	1.99	_____
4	Irrig.	800	GPM	0.03	0.56	2.O9D	0.93	0.00	3.02	_____
5	Windrow	Custom								
6	Combine	3.8	Ac/hr	0.31	0.26	1.79D	4.06	0.76	6.61	_____
7	Truck	Custom								
8	Auger	2500	Bu/hr	0.04	0.03	0.12D	0.03	0.02	0.17	_____
Subtotal				0.77 Hrs		5.52	5.59	2.26	$13.37	_____
	Diesel	7.73	Gal @	$0.65	$5.02					

Materials & Services		Operation #	Units per Acre		Cost per Unit	Cost per Acre	Sub-Total	Your Estimate
Seed	Alfalfa	3	12	lb	3.44	41.28	$41.28	_____
	Oats	3	1.5	bu	5.00	7.50	7.50	_____
Fertilizer	18-46-0	1	175	lb	0.11	19.25	19.25	_____
	46-0-0	1	85	lb. N	0.23	19.55	19.55	_____
Custom	Spread Fert.	1	1	ac	3.50	3.50	3.50	_____
	Windrower	4	1	ac	7.50	7.50	7.50	_____
	Truck	6	70	bu	0.12	8.40	8.40	_____
Subtotal							$106.98	_____
Total Operating Costs excluding Interest& Unpaid Labor							$120.35	_____
Interest on Oper. Capital			$120.35	@ 10.0% for 8 Months			8.02	_____
Unpaid Labor			0.77	Hours $6.00 /hr			4.62	_____
Total Operating Costs							$132.99	_____
Projected Returns								
	Oats		70	Bu	@ $1.50		$105.00	_____
	Crop Residue		1	AUM			0.00	_____
Total Returns							$105.00	_____
Net Return above Operating Costs							($27.99)	_____

PivotA

Returns Above Operating Costs Budget Worksheet
Alfalfa Hay,Center Pivot Irrig.,Diesel,281'H
18 Acre-inches 5 Ton Hay

Operation #	Description	Operation Rate		Hrs per Acre Labor	Hrs per Acre Mach	Cost per Acre Fuel & Lube	Cost per Acre Repairs Power	Cost per Acre Repairs Impl	Cost per Acre Sub-Total	Your Estimate
1	Spread Fert.	Custom								
2	Windrow	5.07	Ac/hr	0.24	0.20	0.54D	2.97	0.00	3.51	_____
3	Bale	7	Ton/hr	0.29	0.24	0.86D	0.56	0.82	2.24	_____
4	Windrow	5.07	Ac/hr	0.24	0.20	0.54D	2.97	0.00	3.51	_____
5	Bale	7	Ton/hr	0.29	0.24	0.86D	0.56	0.82	2.24	_____
6	Windrow	5.07	Ac/hr	0.24	0.20	0.54D	2.97	0.00	3.51	_____
7	Bale	7	Ton/hr	0.29	0.24	0.89D	0.58	0.82	2.29	_____
8	All Irrig.	800	GPM	0.61	10.10	37.54D	16.76	0.00	54.30	_____
9	Move Bales	Custom								
Subtotal				2.20	Hrs	41.77	27.37	2.46	$71.60	_____
	Diesel	58.47	Gal @	$0.65	$38.01					

Materials & Services		Operation #	Units per Acre		Cost per Unit	Cost per Acre	Sub-Total	Your Estimate
Fertilizer	18-46-0	1	40	lb	0.11	4.40	$4.40	_____
	Potass Mag	1	9	lb	0.09	0.81	0.81	_____
Custom	Spread Fert.	1	1	ac	3.25	3.25	3.25	_____
	Move Bales	9	10	bale	1.00	10.00	10.00	_____
Other	Twine	3	4	bales	0.40	1.60	1.60	_____
	Twine	5	3	bales	0.40	1.20	1.20	_____
	Twine	7	3	bales	0.40	1.20	1.20	_____
Subtotal							$22.46	_____
Total Operating Costs excluding Interest & Unpaid Labor							$94.06	_____
Interest on Oper. Capital			$94.06	@ 10.0% for 8 Months			6.27	_____
Unpaid Labor			2.20	Hours $6.00/hr			13.20	_____
Total Operating Costs							$113.53	_____
Projected Returns								
Hay			5	Ton @ $50.00			$250.00	_____
Crop Residue			1	AUM @			0.00	_____
Total Returns							$250.00	_____
Net Return above Operating Costs							$136.47	_____

DryCfC

Returns Above Operating Costs Budget Worksheet
Corn For Grain,Nonlrrigated
65 Bu. Corn

Operation #	Description	Operation Rate		Hrs per Acre Labor	Hrs per Acre Mach	Cost per Acre Fuel & Lube	Cost per Acre Repairs Power	Cost per Acre Repairs Impl	Cost per Acre Sub-Total	Your Estimate
1	Disc w/Harrow	10.63	Ac/hr	0.11	0.09	0.52D	0.25	0.49	1.26	_____
2	Anhy. Apply	6.87	Ac/hr	0.18	0.15	0.80D	0.38	0.22	1.40	_____
3	Disc w/Harrow	10.63	Ac/hr	0.11	0.09	0.52D	0.25	0.49	1.26	_____
4	Plant	4.9	Ac/hr	0.24	0.20	0.89D	0.25	1.18	2.32	_____
5	Row Crop Cult.	5.29	Ac/hr	0.23	0.19	1.04D	0.50	0.28	1.82	_____
6	Row Crop Cult.	5.29	Ac/hr	0.23	0.19	1.04D	0.50	0.28	1.82	_____
7	Combine	4.5	Ac/hr	0.26	0.22	1.51D	5.95	0.95	8.41	_____
8	Truck	Custom								
9	Auger	2500	Bu./hr	0.04	0.03	0.04D	0.05	0.01	0.10	_____
10	Dry	Custom								
Subtotal				1.40 Hrs		6.36	8.13	3.90	$18.39	_____
	Diesel	8.84	Gal @ $0.65 $5.74							

Materials & Services		Operation #	Units per Acre		Cost per Unit	Cost per Acre	Sub-Total	Your Estimate
Seed	Corn	4	0.17	bag	79.23	13.47	$13.47	_____
Fertilizer	Anhy. N	2	70	lb. N	0.18	12.60	18.10	_____
	18-46-0	4	50	lb	0.11	5.50		
Chemicals	Bicep	4	0.9	qt	8.13	7.32	7.32	_____
Custom	Truck	8	65	bu	0.12	7.80	14.30	_____
	Drying	10	65	bu	0.10	6.50		
Subtotal							$53.19	_____
Total Operating Costs excluding Interest & Unpaid Labor							$71.58	_____
Interest on Oper. Capital			$71.58	@ 10.0% for 8 Months			4.77	_____
Unpaid Labor			1.40	Hours $6.00 /hr			8.40	_____
Total Operating Costs							$84.75	_____
Projected Returns								
Corn			65	Bu. @ $2.24			$145.60	_____
Crop Residue			1	AUM			0.00	_____
Total Returns							$145.60	_____
Net Return above Operating Costs excluding defic. payment							$60.85	_____
Deficiency Payment:			$2.75	Target $2.21 Nat'l Ave				
110 Bu HWY yield @			$0.54				$59.40	_____
Net Return above Operating Costs							$120.25	_____

DryCfA

Returns Above Operating Costs Budget Worksheet
Corn For Grain,NonIrrigated ff Alfalfa
75 Bu. Corn

Operation #	Description	Operation Rate		Hrs per Acre Labor	Hrs per Acre Mach	Cost per Acre Fuel & Lube	Cost per Acre Repairs Power	Cost per Acre Repairs Impl	Cost per Acre Sub-Total	Your Estimate
1	Spray	Custom								
2	Chisel	9.76	Ac/hr	0.12	0.10	0.56D	0.27	0.42	1.25	_____
3	Field Cult.	12.22	Ac/hr	0.10	0.08	0.45D	0.21	0.19	0.85	_____
4	Disc w/Harrow	10.63	Ac/hr	0.11	0.09	0.52D	0.25	0.49	1.26	_____
5	Plant	4.9	Ac/hr	0.24	0.20	0.89D	0.25	1.18	2.32	_____
6	Row Crop Cult.	5.29	Ac/hr	0.23	0.19	l.04D	0.50	0.28	1.82	_____
7	Row Crop Cult.	5.29	Ac/hr	0.23	0.19	1.04D	0.50	0.28	1.82	_____
8	Combine	4.5	Ac/hr	0.26	0.22	1.51D	5.95	0.95	8.41	_____
9	Truck	Custom								
10	Auger	2500	Bu./hr	0.04	0.03	0.04D	0.05	0.01	0.10	_____
11	Dry	Custom								
Subtotal				1.33	Hrs	6.05	7.98	3.80	$17.83	_____
	Diesel		8.38Gal @ $0.65 $5.44							

Materials & Services		Operation #	Units per Acre		Cost per Unit	Cost per Acre	Sub-Total	Your Estimate
Seed	Corn	5	0.17	bag	79.23	13.47	$13.47	_____
Fertilizer	18-46-0	5	50	lb	0.11	5.50	5.50	_____
Herbicide	2,4D Ester	1	1	qt	1.69	1.69	13.66	_____
	Banvel	1	0.5	pt	9.31	4.66		
	Bicep	5	0.9	qt	8.13	7.32		
Custom	Sprayer	1	1	ac	3.50	3.50	20.00	_____
	Truck	9	75	bu	0.12	9.00		
	Drying	11	75	bu	0.10	7.50		
Subtotal							$52.63	_____
Total Operating Costs excluding Interest & Unpaid Labor							$70.46	_____
Interest on Oper. Capital			$70.46	@ 10.0% for 8 Months			4.70	_____
Unpaid Labor			1.33	Hours $6.00 /hr			7.98	_____
Total Operating Costs							$83.14	_____
Projected Returns								
Corn			75	Bu.	@ $2.24		$168.00	_____
Crop Residue			1	AUM	0.00			
Total Returns							$168.00	_____
Net Return above Operating Costs excluding defic. payment							$84.86	_____
Deficiency Payment:			$2.75	Target $2.21 Nat'l Ave				
110 Bu HWY yield @			$0.54				$59.40	_____
Net Return above Operating Costs							$144.26	_____

Dry Oats

Returns Above Operating Costs Budget Worksheet
Oats With Spring Alfalfa Seeding
50 Bu Oats

Operation #	Description	Operation Rate		Hrs per Acre Labor	Hrs per Acre Mach	Cost per Acre Fuel & Lube	Cost per Acre Repairs Power	Cost per Acre Repairs Impl	Cost per Acre Sub-Total	Your Estimate
1	Spread Fert.	Custom								
2	Disc w/Harrow	7.8	Ac/hr	0.16	0.13	0.71D	0.34	0.53	1.58	_____
3	Drill	5.4	Ac/hr	0.23	0.19	0.81D	0.23	0.95	1.99	_____
4	Windrow	Custom								
5	Combine	3.8	Ac/hr	0.31	0.26	1.79D	4.06	0.76	6.61	_____
6	Truck	Custom								
7	Auger	2500	Bu/hr	0.02	0.02	0.09D	0.02	0.01	0.12	_____
Subtotal				0.72	Hrs	3.40	4.65	2.25	$10.30	_____
	Diesel	4.75	Gal @	$0.65	$3.09					

Materials & Services		Operation #	Units per Acre		Cost per Unit	Cost per Acre	Sub-Total	Your Estimate
Seed	Alfalfa	3	12	lb	3.44	41.28	$48.78	_____
	Oats	3	1.5	bu	5.00	7.50		
Fertilizer	18-46-0	1	175	lb	0.11	19.25	38.80	_____
	46-0-0	1	85	lb. N	0.23	19.55		
Custom	Spread Fert.	1	1	ac	3.50	3.50	17.00	_____
	Windrower	4	1	ac	7.50	7.50		
	Truck	6	50	bu	0.12	6.00		
Subtotal							$104.58	_____
Total Operating Costs excluding Interest & Unpaid Labor							$114.88	_____
Interest on Oper. Capital			$114.88	@ 10.0% for 8 Months			7.66	_____
Unpaid Labor			0.72	Hours $6.00 /hr			4.32	_____
Total Operating Costs							$126.86	_____
Projected Returns								
	Oats		50	Bu	@	$1.50	$75.00	_____
	Crop Residue		1	AUM	0.00			
Total Returns							$75.00	_____
Net Return above Operating Costs							($51.86)	_____

DryA

Returns Above Operating Costs Budget Worksheet
Alfalfa Hay, Large Round Baler
3 Ton Hay

Operation #	Description	Operation Rate		Hrs per Acre Labor	Hrs per Acre Mach	Cost per Acre Fuel & Lube	Cost per Acre Repairs Power	Cost per Acre Repairs Impl	Cost per Acre Sub-Total	Your Estimate
1	Spread Fert. Custom									
2	Spray 1/10yr	10.2	Ac/hr	0.12	0.10	0.430	0.12	0.09	0.64	_____
3	Windrow	5.7	Ac/hr	0.22	0.18	0.97D	0.46	1.34	2.77	_____
4	Bale	6.3	Ton/hr	0.19	0.16	0.87D	0.41	1.18	2.46	_____
5	Windrow	5.7	Ac/hr	0.22	0.18	0.97D	0.46	1.34	2.77	_____
6	Bale	6.3	Ton/hr	0.19	0.16	0.87D	0.41	1.18	2.46	_____
7	Windrow	5.7	Ac/hr	0.22	0.18	0.97D	0.46	1.34	2.77	_____
8	Bale	6.3	Ton/hr	0.19	0.16	0.89D	0.42	1.18	2.49	_____
9	Move Bales	Custom								
Subtotal				1.35	Hrs	5.97	2.74	7.65	$16.36	_____

Diesel 8.46 Gal @ $0.65 $5.50

Materials & Services		Operation #	Units per Acre		Cost per Unit	Cost per Acre	Sub-Total	Your Estimate
Fertilizer	18-46-0	1	65	lb	0.11	7.15	$7.15	_____
Chemicals	Pounce 1/10 yr	2	0.6	oz	1.30	0.78	0.78	_____
Custom	Spread Fert.	1	1	ac	3.25	3.25	7.25	_____
	Move Bales	9	4	bales	1.00	4.00		
Other	Twine	4	1.3	bales	0.40	0.52	1.56	_____
	Twine	6	1.3	bales	0.40	0.52		
	Twine	8	1.3	bales	0.40	0.52		
Subtotal							$16.74	_____
Total Operating Costs excluding Interest & Unpaid Labor							$33.10	_____
Interest on Oper. Capital			$33.10	@ 10.0% for 8 Months			2.21	_____
Unpaid Labor			1.35	Hours $6.00/hr			8.10	_____
Total Operating Costs							$43.41	_____
Projected Returns								
	Hay		3	Ton @ $50.00			$150.00	_____
	Crop Residue		1	AUM			0.00	_____
Total Returns							$150.00	_____
Net Return above Operating Costs							$106.59	_____

Pasture Budget

Value of Production

Per Acre

_____ head x _____ months x = $_____/head/month=$ _____/_____acres= 1 _____

Oversight of Cattle

Labor: _____ days x _____ hours per day x $ _____/hour = $_____/_____ acres = 2_____

Pickup: _____ days x _____ miles per day x $_____/mile = $_____/_____ acres = 3_____

Fencing Costs Ownership Costs	(Purchase Cost	+	Salvage / Value)	Useful= Life	Annual Deprec.
Perimeter fence_____ _____ feet @ $ _____ /ft	(_____	+	_____)/	____yrs =	_____
Interior fence_____ _____ feet @ $_____ /ft *	(_____	+	_____)/	____yrs =	_____
Gates _____ @ $ _____ /gate	(_____	+	_____)/	____yrs =	_____
Energizer	* (_____	+	_____)/	____yrs =	_____
Total	_____		_____		_____
Subject to personal property tax*	_____		_____		_____

Annual Depreciation Costs per acre Total Annual Deprec/Acres

$_____/_____ acres= 4_____

Average Annual Investment

(Value Beg. Yr 1 + Value Beg. Last Yr of Use)/2 =
(Purchase Cost + Salvage Value + Annual Deprec)/2 =

Total ($_____ + $_____ + $_____)/2 = $_____
Personal Property ($_____ + $_____ + $_____)/2 = $_____

Annual Interest Costs per acre

Average Annual Investment x (Interest Rate/100)/acres

$_____ x (_____%/100) = $_____/_____acres = 5_____

Annual Personal Property Tax per Aare

Average Annual Investment subject to PP Tax x (Tax Rate/100)/acres =

$_____ x ($_____/100) = $_____/_____ acres = 6 _____

Operating Costs

Annual Fence Repair Costs per acre

_____ miles @ $_____mile/year = $_____/_____ acres = 7 _____

Annual Energy Costs per acre =

___ kwh/month x ___ months =

_____ kwh @ $_____/kwh = $_____/_____ acres = 8 _____

Total annual fencing costs per acre Sum lines 2 through 8 = 9_____

Pasture Budget

Value of Production — Per Acre

38 head x 6 months x = $ 25 /head/month=$ 5,700 / 160 acres= 1 $35.60

Oversight of Cattle

Labor: 180 days x 1 hours per day x $ 6 /hour = $ 1,080 / 160 acres = 2 6.75

Pickup: 180 days x 5 miles per day x $ .42 /mile = $ 378 / 160 acres = 3 2.36

Fencing Costs Ownership Costs	(Purchase Cost	+	Salvage / Value)	Useful= Life	Annual Deprec.
Perimeter fence 4-strand barbed wire 10,560 feet @ $ 0.65 /ft	*6,864	+	0	)/ 35 yrs =	$196.11
Interior fence 2-strand HTE 5,280 feet @ $ 0.45 /ft	*(2,376	+	0	)/ 35 yrs =	67.89
Gates 4 @ $ 50 /gate	(200	+	0	)/ 40 yrs =	5.00
Energizer	* (300	+	0	)/ 15 yrs =	20.00
Total	$9,740		0		289.00
Subject to personal property tax*	$2,676		0		87.89

Annual Depreciation Costs per acre Total Annual Deprec/Acres

$ 289 / 160 acres= 4 1.81

Average Annual Investment

(Value Beg. Yr 1 + Value Beg. Last Yr of Use)/2 =
(Purchase Cost + Salvage Value + Annual Deprec)/2 =

Total ($ 9,740 + $ 0 + $ 289)/2 = $ 5,015
Personal Property ($ 2,676 + $ 0 + $ 87.89)/2 = $ 1,382

Annual Interest Costs per acre

Average Annual Investment x (Interest Rate/100)/acres

$5,015 x (6 %/100) = $ 300.90 / 160 acres = 5 1.88

Annual Personal Property Tax per Aare

Average Annual Investment subject to PP Tax x (Tax Rate/100)/acres =

$1,382 x ($ 2 /100) = $ 27.64 / 160 acres = 6 .17

Operating Costs

Annual Fence Repair Costs per acre

2 miles @ $ 42 mile/year = $ 84 / 160 acres = 7 .53

Annual Energy Costs per acre =

30 kwh/month x 6 months =

180 kwh @ $ .0935 /kwh = $ 16.83 / 160 acres = 8 .11

Total annual fencing costs per acre — Sum lines 2 through 8 = 9 $13.61

Pasture Budget(continued)

Water System Costs Ownership Costs		(Purchase + Salvage / Useful = Annual Cost Value) Life Deprec.
Well _____ feet @ $ _____ /ft		(_____ + _____)/ ____yrs = _____
Pipe _____ feet @ $ _____ /ft		(_____ + _____)/ ____yrs = _____
Pump _____ hp		(_____ + _____)/ ____yrs = _____
Pressure Tank _____gal	*	(_____ + _____)/ ____yrs = _____
___ft Tanks____@ $_____/tank	*	(_____ + _____)/ ____yrs = _____
____Floats & valves @ $_____/tank	*	(_____ + _____)/ ____yrs = _____
Electrical Service	*	(_____ + _____)/ ____yrs = _____
Total		_____ _____ _____
Subject to personal property tax*		_____ _____ _____

Annual Depreciation Costs per acre = Total ANnual Deprec/Acres = Per Acre

$_____/_____ acres = 10 _____

Average Annual Investment =

(Value Beg. Yr 1 + Value Beg. Last Yr of Use)/2 =

Total ($_____ + $_____ + $_____)/2 = $_____

Personal Property ($_____ + $_____ + $_____)/2 = $_____

Annual Interest Costs per Acre =

Average Annual Investment x (Interest Rate/100)/acres =

$_____ x (_____%/100) = $_____/_____acres = 11 _____

Annual Personal Property Tax per acre =
Average Annual Investment subject to PP Tax x (Tax Rate/100)/acres =
$_____ x (_____/100) = $_____/_____acres = 12_____

Pumping Costs

Hours pumping =
____ head x ____gals/days x ____ days = _____ gals

_____ gals/____gpm=_____minutes/60 =_____hours

kwh cost = _____hours @ ____hw/hr = _____kwh @ $_____/kwh $_____
Repair costs = _____hours @ $___/hr = $_____
Meter charge = $_____/month x ____ months = $_____
Total $_____

Pumping costs per acre = $ Total/acres= $_____/_____ acres= 13_____

Total annual water costs per acre Sum lines 10 through 13 = 14_____

Real estate taxes 15_____

Net return to land, management and to pay overheads Line 1 - (Line 9 - Line 14) - Line 15 = 16_____

Pasture Budget(continued)

Water System Costs Ownership Costs		(Purchase Cost	+ Salvage Value)	/ Useful Life	= Annual Deprec.
Well 200 feet @ $ 8 /ft		($1,600	+ 0	)/ 25 yrs	= $64.00
Pipe 1,320 feet @ $ 1 /ft		(1,320	+ 0	)/ 20 yrs	= 66.00
Pump 1 hp		(680	+ 0	)/ 18 yrs	= 37.78
Pressure Tank 50 gal	*	(820	+ 0	)/ 20 yrs	= 41.00
11 ft Tanks 1 @ $ 360 /tank	*	(360	+ 0	)/ 15 yrs	= 24.00
1 Floats & valves @ $ 30 /tank	*	(30	+ 0	)/ 5 yrs	= 6.00
Electrical Service	*	(300	+ 0	)/ 50 yrs	= 6.00
Total		$5,110	0		$244.78
Subject to personal property tax*		$1,890	0		$108.78

Annual Depreciation Costs per acre = Total ANnual Deprec/Acres = Per Acre

$ 244.78 / 160 acres = 10 $1.53

Average Annual Investment =

(Value Beg. Yr 1 + Value Beg. Last Yr of Use)/2 =

Total ($ 5,110 + $ 0 + $ 244.78)/2 = $ 2,678

Personal Property ($ 1,890 + $ 0 + $ 108.78)/2 = $ 1,040

Annual Interest Costs per Acre =

Average Annual Investment x (Interest Rate/100)/acres =

$ 2,678 x (6 %/100) = $ 160.68 / 160 acres = 11 $1.00

Annual Personal Property Tax per acre =
Average Annual Investment subject to PP Tax x (Tax Rate/100)/acres =
$ 1,040 x (2 /100) = $ 20.80 / 160 acres = 12 $ .13

Pumping Costs

Hours pumping =
38 head x 15 gals/days x 180 days = 102,600 gals

102,600 gals/ 7 gpm= 14,657 minutes/60 = 244 hours

kwh cost = 244 hours @ 1.5 hw/hr = 366 kwh @ $ .0935 /kwh $ 34.22
Repair costs = 244 hours @ $.07/hr = $ 17.08
Meter charge = $ 8.50 /month x 6 months = $ 51.00
Total $ 102.30

Pumping costs per acre = $ Total/acres= $ 102.30 / 160 acres= 13 $ .64

Total annual water costs per acre Sum lines 10 through 13 = 14 $3.30

Real estate taxes 15 $2.00

Net return to land, management and to pay overheads Line 1 - Line 9 - Line 14 - Line 15 = 16 $16.69

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