

Perennial Forages and Grazing

Perennial forage plantings are excellent practices for soil and water improvement. An established perennial forage stand is like a sponge, soaking up both water and nutrients and allowing very little of either to escape into groundwater or surface water. Land in a perennial forage crop is not tilled, which is beneficial for soil health. Tillage – plowing, disking, or similar operations – destroys both soil structure and soil organic matter; so the more years in

Alfalfa Nitrogen Credit

A fair stand of alfalfa on medium-textured soil can provide 160 lbs./acre of nitrogen to the corn crop that comes after it (1).

Using a 2012 nitrogen price of \$0.60 per lb. (2):

160 lbs. nitrogen/acre x \$0.60/lb = \$96/acre nitrogen credit from the alfalfa crop

Because breakdown of plant matter in the soil takes place gradually over time, the plowed-down alfalfa crop will also supply nitrogen to the second year of corn after the alfalfa is plowed down.

50 lbs. nitrogen/acre 2nd-year credit (1) x \$0.60/lb (2) = \$30/acre 2nd-year credit from the alfalfa crop.

References:

(1) **Using Legumes as a Nitrogen Source.** June 1997. L.G. Bundy, K.A. Kelling and L. Ward Good. University of Wisconsin Extension, publication #A3517.
<http://ipcm.wisc.edu/download/pubsNM/Usinglegumes.pdf>

(2) **Fertilizer Use and Price.** Reports from the Economic Research Service, USDA.
www.ers.usda.gov/data-products/fertilizer-use-and-price.aspx#26727. (accessed 6/11/13)

a rotation that the soil is in a perennial crop and not tilled, the better for the soil (1).

Legume forage crops are very useful in crop rotations as a way to break weed, pest and disease cycles and add nitrogen to the soil. Forage crops help reduce weed pressure in several ways. The thick ground cover of forage reduces the amount of sunlight that reaches the soil surface, which prevents some weed seeds from germinating. The forage crop out-competes most weed seedlings that do sprout, and harvest of the forage removes growing weeds before they can produce seeds. Forage crops in a rotation reduce the level of insect pests

and diseases because the forage crop is typically not the host plant for insects and diseases that harm cash crops. Having a field planted to something other than the host plant (the grain crop) for at least a year means those insects and disease organisms don't have the food or shelter they need from the host plant in order to complete their life cycle, so they die off (2).

Long-term perennial forage is a reasonable choice to consider on your land's most productive acres. Alfalfa hay production can be financially competitive with cash grain production. Perennial forage also has potential to generate income and environmental benefits on the more marginal land. Acres that produce less than the farm's average yield of corn or soybeans might be more profitable in a forage crop. Acres that are difficult to plant to row crops because they are too steep, too wet, too dry, or are in odd-shaped areas that don't work well with large field equipment are all good candidates for a permanent forage planting.

Many programs administered by the Natural Resources Conservation Service offer incentives for conservation practices such as perennial pastures. Some examples include the Conservation Reserve Enhancement Program (CREP), the Conservation Reserve Program (CRP), the Conservation Stewardship Program (CSP) and the Grassland Reserve Program (GRP).

The Conservation Stewardship Program is a "working lands" program that provides payments for whole farm plans in which acres in perennials can be harvested, either by

Federal Farm-Level Conservation Programs

USDA conservation programs are administered by the Farm Service Agency (FSA) and Natural Resources Conservation Service (NRCS) which are accessible throughout the nation in county and regional field offices called USDA Service Centers. Find the USDA Service Center nearest to you at <http://offices.sc.gov.usda.gov/locator/app>

USDA Natural Resource Conservation Service conservation programs:

- Wetland Reserve Program
www.nrcs.usda.gov/wps/portal/nrcs/main/national/programs/easements/wetlands/
- Grasslands Reserve Program
www.nrcs.usda.gov/wps/portal/nrcs/main/national/programs/easements/grassland/
- Healthy Forests Reserve Program
www.nrcs.usda.gov/wps/portal/nrcs/main/national/programs/easements/forests/
- Farm and Ranch Lands Protection Program
www.nrcs.usda.gov/wps/portal/nrcs/main/national/programs/easements/farmranch/
- Environmental Quality Incentive Program
www.nrcs.usda.gov/wps/portal/nrcs/main/national/programs/financial/equip/
- Conservation Stewardship Program
www.nrcs.usda.gov/wps/portal/nrcs/main/national/programs/financial/csp/

USDA Farm Service Agency conservation programs:

- Conservation Reserve Program
www.fsa.usda.gov/FSA/webapp?area=home&subject=copr&topic=crp
- Transition Incentive Program
www.fsa.usda.gov/FSA/webapp?area=home&subject=copr&topic=tipr

machine or by grazing livestock. The other programs are land retirement programs, in which cost-share is available for planting, nothing is harvested, and contract payments substitute for crop sales (see Federal Farm-Level Conservation Programs text box). If having acreage permanently in perennial grasses or legumes is something you want for your legacy on the land, then these programs can be part of the total package that makes it financially feasible for you or future farmers to plant and maintain those acres. Your local NRCS office can explain the details of these programs, the requirements and restrictions associated with them, and the contract payment amounts. Search for your local NRCS office:
<http://offices.sc.egov.usda.gov/locator/app?agency=nrcs>.

Perennial forages combined with contract grazing can be a good entry option for a beginning farmer. If helping a new farmer get started is part of your family's goal for the land, this is a path to consider. A new farmer can lease or rent acres in perennial forage, get a contract to graze someone else's cattle on those acres, and only have to invest capital in fencing equipment. This type of farmer is called a "grazier" -- a person who manages the grazing of livestock on pastures. Managed grazing can be a profitable, productive, and environmentally beneficial use of land (3). Pasture rental agreements or pasture leases should be structured to be fair to the landowner, the livestock owner, and the grazier (two or three of those roles might be held by the same person). In a typical rental or lease agreement, the landowner is responsible for the perimeter fence and the grazier is responsible for the internal, temporary fences needed to move cattle through the pasture in a managed grazing system (4).

Hay or haylage production requires different planting and harvest equipment than grain production, as well as more labor. Those costs are accounted for in the net income figure for alfalfa, but in spite of those costs being accounted for on paper, they remain a barrier to many farmers who are strapped for time. Dealing with a different set of equipment and a different type of crop adds a level of complexity to a grain farm operation, which requires management effort and knowledge. Those issues are not well captured by traditional accounting methods, but they are costs or barriers that must be considered in a farm transition plan.

If you want to ensure that perennial forages are part of the farming operation on your land in the future, then your expectations for sale, rental, or lease price for your land must match up with what is affordable for a farming operation that includes or is wholly based on perennial forages. For hay crops, leases should be for at least three years to ensure that the farmer gains the benefits from her or his investment in planting a perennial forage crop. The terms of the lease should include a credit to the farm operator for the nitrogen benefit to the next grain crop if a different farmer will have the land after the hay crop is plowed down. With both pasture and hay, consider including a credit to the farm operator for management efforts that contribute to improved soil health and reduced soil erosion and water runoff.

Fencing & Watering Costs

These calculations are based on a 40-acre square pasture, ¼ mile on each side. One mile of fence will enclose the pasture. Other pasture sizes and shapes are very common. Cost per acre of fencing will increase if a smaller area or oddly-shaped area is enclosed. Cost per acre of fencing will decrease if a larger area is enclosed.

Fencing:

Construction cost per foot of high-tensile electrified five-wire fence: \$1.24

- Construction cost per mile: $\$1.24 \times 5,280 \text{ ft.} = \$4,699.20$ (rounded up to \$4,700)
- If the 1-mile fence encloses 40 acres, construction cost = \$117.50/acre.
- This fence has a 25-year lifetime, so $\$117.50/25 = \$4.70/\text{acre}/\text{year}$ fence construction cost

Annual maintenance and ownership cost of high-tensile electrified five-wire fence:
\$0.12/foot/year (1)

- Annual maintenance cost per mile: $\$0.12/\text{ft.} \times 5,280 \text{ ft.} = \633.60
- Spread over 40 acres: $\$633.60/\text{mile}/\text{year} / 40 \text{ acres} = \$16/\text{acre}/\text{year}$ fence maintenance cost

Cost for temporary divider fence for managed grazing: \$0.20/ft. (1)

- Cost for ½ mile of temporary fence: $\$0.20/\text{ft.} \times 2,640 \text{ ft.} = \528
- Four-year lifespan, so $\$528/4 = \$132/\text{year}$
- Spread over 40 acres: $\$3.30/\text{acre}/\text{year}$ for temporary fencing to do managed grazing

continued on next page ...

Fencing & Watering Costs, continued (pg. 2)

Watering:

Cost to run 1 mile of 1-1/4" irrigation plastic pipe with fittings and a 100-gallon tank: \$3,000 (2)

Spread over 40 acres: \$75/acre

Estimated 10-year lifespan, so \$7.50/acre/year for watering system

A couple of things to note:

- This is for an above-ground system and the cost figure does not include the labor costs to lay the pipe in spring and remove it in fall.
- Thoughtful layout of paddocks and configuration of the watering system can reduce costs; the system may require significantly less than 1 mile of pipe.

References:

- (1) **Estimated Costs for Livestock Fencing.** Updated December 2012. Ralph Mayer and Tom Olsen; revised by William Edwards and Andy Chamra. Iowa State University Extension and Outreach. File B1-75. www.extension.iastate.edu/agdm/livestock/html/b1-75.html (accessed 8/20/13).
- (2) **The ABCs of Livestock Watering Systems.** 2006. Ben Bartlett. Midwest Plan Service, Iowa State University. www.extension.org/mediawiki/files/d/d2/9_Watering.pdf (accessed 8/20/13).

Grazing Income

Income from grazing varies widely depending on the productivity of the land, the condition of the pasture, and the grazing season. This example draws from two specific sample leases from south-central Wisconsin (1,2). The dollar figures used fall within ranges reported for custom grazing of cattle in Wisconsin and Iowa (3).

Assumptions for this example:

- The \$/head/day amount includes the cost of the land lease plus the grazing management. In other words, in this example a landowner does custom grazing of another person's cattle.
- The stocking rate is a season-long average. Some graziers stock at a higher rate in the spring and reduce the rate as forage production declines in the fall. Drought results in earlier and larger reduction in the stocking rate.
- Rotational grazing is used
- Pasture is an upland grass and clover mixture with no fertilizer applied.

Stocking rate permitted (1) = 0.625 AU/acre (AU=Animal Unit = 1000 lbs. of cow)

Contract for custom-grazing dairy heifers (2):

- 230 animals, average weight of 600 lbs. = 138,000 lbs. = 138 AU
- 138 AU / 0.625 AU/acre stocking rate = 220 acres
- Contract grazing rate: \$1.37/animal/day (1) x 230 animals = \$315.10/animal/day
- Days of grazing: approximately 180 days (mid-April through mid-October) (2)
- Total payment due under contract: \$315.10/day x 180 days = \$56,718
- Payment per acre: \$56,718/220 acres = \$258/acre (round: \$260/acre)

Note: The \$260/acre is a gross income figure. The landowner doing the custom grazing has costs for labor and management time, perimeter fence maintenance, a watering system, mineral supplements, and fencing supplies for temporary fence.

References:

- (1) **Contract for grazing on 320 acres, livestock managed by livestock owner.** 2013. Midwest Perennial Forage Working Group.
http://greenlandsbluewaters.net/Perennial_Forage/sample_contracts_leases.html
- (2) **Contract for custom grazing of dairy heifers, livestock managed by landowner.** 2013. Midwest Perennial Forage Working Group.
http://greenlandsbluewaters.net/Perennial_Forage/sample_contracts_leases.html
- (3) **Rates Charged for Contract Grazing Arrangements.** 2013. Midwest Perennial Forage Working Group.
http://greenlandsbluewaters.net/Perennial_Forage/CG_Rates_final_0313.pdf

Perennial Forage			
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Qualitative Benefits of the Practice	Cost of Implementation and Potential Income Loss	Potential Income Gain and Reduced/Avoided Costs	Your Judgment: Value Per Acre of This Practice on Your Land
<p>Improved soil structure through having living roots in the ground year-round.</p> <p>Less soil erosion and less water runoff from a forage crop or well-managed pasture than from a grain crop</p> <p>Reduces weed pressure in the next cash crop</p> <p>Reduces insect and disease pressure in the next cash crop</p>	<p>Loss of net income from cash grain crop: \$230/acre/year. <i>(See Corn & Soybean Profitability text box in the Crop Rotation section)</i></p> <p>Cost to build perimeter fence around a 40-acre pasture: \$4,700 for a 25-year fence; \$4.70/acre/year <i>(See Fencing & Watering Costs text box)</i></p> <p>Annual maintenance cost for high-tensile electrified wire perimeter fence: \$16/acre <i>(See Fencing & Watering Costs text box)</i></p> <p>Cost of temporary, movable fence for managed grazing: \$3.30/acre/year <i>(See Fencing & Watering Costs text box)</i></p> <p>1-mile watering system:</p>	<p>Grazing land lease of \$50/acre/year (lease only; not counting potential additional income from labor and management of grazing system)(6)</p> <p>Grazing land plus grazier services (labor and management for cattle herd on pasture): \$230/acre/year gross income <i>(see Grazing Income text box)</i></p> <p>Alfalfa hay production, net income: \$228/acre/year (7)</p> <p>Plow-down value of alfalfa in providing nitrogen to next cash crop: \$96/acre <i>(See Alfalfa Nitrogen Credit text box)</i></p> <p>Plow-down value of alfalfa in providing nitrogen to the second-year cash crop: \$30/acre <i>(See Alfalfa Nitrogen Credit text box)</i></p>	<p>Potential income gain and costs avoided: +</p> <p>Potential income loss and costs to pay: -</p> <p>Your judgment on value to your farm of qualitative benefits: +</p> <p>Value to society or environment: +</p> <p>Add up the total net value per acre per year:</p> <p>Multiply by number of acres devoted to the practice:</p> <p>Multiply by a time frame (5 years? 10 years?)</p> <p>Total value over time:</p>

<p>The numbers in this table are broad estimates, and you should adjust them for your farm's conditions.</p>	<p>\$7.50/acre/year (<i>See Fencing & Watering Costs text box</i>)</p> <p>Cost of land ownership: \$27/acre/year (includes interest, taxes, depreciation on facilities) (5)</p>	<p>\$8.60/acre/year gain in fertilizer value of soil by saving 4.1 tons/acre/year from soil erosion; cumulative over years (<i>See Value of Saving Soil text box in the Crop Rotation section</i>)</p> <p>Benefit to society: approximately \$20/acre/year gain in water quality value of soil by saving 4.1 tons/acre/year of soil from erosion (<i>See Value of Saving Soil text box in the Crop Rotation section</i>)</p>	
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References:

- (1) **Organic Matter Management.** In The Soil Management Series. Revised 2008. Ann Lewandowski.
http://www.extension.umn.edu/distribution/cropsystems/components/7402_02.html
(accessed 6/11/13).
- (2) **Rotation.** 2010. Kristine Moncada and Craig Sheaffer. In *Organic Risk Management*.
<http://www.organicriskmanagement.umn.edu/rotation2.html> (accessed 8/20/13).
- (3) **The Basics of Contract Grazing.** 2013. Midwest Perennial Forage Working Group.
http://greenlandsbluewaters.net/Perennial_Forage/CG_Basics_final_0313.pdf (accessed 8/20/13).
- (4) **Pasture Rental and Lease Agreements.** 2013. Jim Paulson and Richard Cates. Midwest Perennial Forage Working Group.
http://greenlandsbluewaters.net/Perennial_Forage/CG_ContractLeases_final_0313.pdf
(accessed 8/20/13).
- (5) **Pasture Rental Agreements for Your Farm.** December 2011. North Central Farm Management Extension Committee.
http://greenlandsbluewaters.net/Perennial_Forage/NCFMEC-03%20Pasture%20lease.pdf
(accessed 8/20/13).
- (6) **Contract for grazing on 320 acres, livestock managed by livestock owner.** 2013. Midwest Perennial Forage Working Group.
http://greenlandsbluewaters.net/Perennial_Forage/sample_contracts_leases.html (accessed 8/20/13).
- (7) **What does it take to earn a living on the farm?** April, 2013. Gary Hachfeld, University of Minnesota Extension.
http://swroc.cfans.umn.edu/prod/groups/cfans/@pub/@cfans/@swroc/documents/asset/cfans_asset_440374.pdf (accessed 8/06/13).

Further Resources:

Contract Grazing. 2013. Green Lands Blue Waters, Midwest Perennial Forage Working Group. http://greenlandsbluewaters.net/Perennial_Forage/contract.html (accessed 6/11/13).
Series of four fact sheets: Basics of Contract Grazing, Evaluating Land Suitability for Grazing Cattle, Pasture and Rental Lease Agreements, and Rates Charged for Contract Grazing Agreements.

Forages. 2010. Craig Sheaffer. In *Organic Risk Management*. Editors: Kristine Moncada and Craig Sheaffer. University of Minnesota.

www.organicriskmanagement.umn.edu/forages12.html

This online manual is intended as a guide for organic and transitioning producers in the Upper Midwest. The Forages section includes a lot of good forage crop production information that is useful for non-organic farmers as well.

Pasture and Rangeland Management During Drought: ATTRA

https://attra.ncat.org/downloads/water_quality/drought_mgmt.pdf#search=forages

This PowerPoint presentation illustrates some common-sense guidelines on how to manage livestock during a drought. It also discusses strategies that can be implemented before a drought starts that could make life easier for a rancher when the eventual drought conditions do begin.

Perennial Pastures & Hayfields: What’s in them?

Grasses	Legumes	Forbs
<p>Perennial grasses form dense mats of fibrous roots that hold soil in place. Grasses for pasture and hay are generally divided into “cool-season” grasses, which have their main growth in the spring and fall; and “warm-season” grasses, which grow well in the heat of summer. In northern states, cool-season grasses are what you most commonly see in pastures and hayfields.</p>	<p>Legumes are plants related to beans and peas. They have a close relationship with a particular group of bacteria that live in the soil, called <i>Rhizobia</i>. <i>Rhizobia</i> “infect” legume roots where they collect nitrogen that the plants take in from the atmosphere, which is about 70% nitrogen gas. The bacteria transform this atmospheric nitrogen into a form useable by plants. Well-managed legume crops reduce the need for purchased synthetic nitrogen fertilizer, which is produced using fossil fuels.</p>	<p>Forbs are broad-leaved plants that are neither grasses nor legumes. Most of the plants that you recognize as weeds in your garden are forbs. Some forbs are weeds in pasture, and may be harmful to livestock. Some forbs are planted intentionally in pastures to provide variety in the livestock diet. Certain types of forbs have other beneficial effects such as long and fleshy roots that can loosen compacted soil and “scavenge” water and nutrients from deep in the soil.</p>
<p>Common types of cool-season hay & pasture grasses: Timothy, smooth brome grass, orchard grass, quack grass, fescues, ryegrasses</p>	<p>Most common hay & pasture legumes: Alfalfa, red clover, white clover, birdsfoot trefoil</p>	<p>Common planted forbs for pasture: Turnip, chicory</p>
<p>Common types of warm-season grasses in the Midwest: Switchgrass, Big Bluestem, Indiangrass</p>	<p>Less common hay & pasture legumes: Kura clover, sainfoin, crownvetch, alsike clover</p>	<p>Common pasture weeds that are forbs: Canada thistle, goldenrod, curly dock, wild carrot</p>

Reference:

Evaluating Land Suitability for Grazing Cattle. 2013. Midwest Perennial Forage Working Group, Green Lands Blue Waters.
http://greenlandsbluewater.net/Perennial_Forage/CG_Evaluating%20Land_final_0313.pdf