

# IMPROVING PASTURE PRODUCTIVITY AND QUALITY

By Sarah Flack

*Sarah Flack is a consultant specializing in grass based and organic livestock farming. Her recently-released book [The Art of Science and Grazing](#), is available from bookstores or directly from the publisher at [www.chelseagreen.com](http://www.chelseagreen.com).*

Have you noticed that some pastures “run out” during the grazing season so that cows have to be fed more in the barn? Have you ever wondered why some pastures become weedy, short or full of plants the animals won’t eat? Many of these problems are caused by poorly designed grazing systems, poorly managed pastures and by over-grazing damage. This will decrease the number of acres needed to pasture the cows, while increasing the amount and quality of feed from the pastures.

The first part of this article will present a summary of some of the most common grazing system “mistakes”, how these reduce pasture quality and productivity, and how you can get started with a new and improved grazing system to repair that damage. This will help lower grazing season feed costs, and make sure you are meeting the new organic pasture standard. The second part of this article is a worksheet, which can be used to calculate paddock size and number of acres to provide enough pasture to meet the herds pasture dry matter needs.

## **PART ONE: MANAGING PLANTS TO IMPROVE QUALITY & PRODUCTIVITY**

This article will focus mostly on perennial pasture species. However annual pasture species may also be a useful part of a grazing system. Annual plants can be particularly helpful in extending the grazing season into the fall or through the mid summer heat. Annual pasture, since they are replanted each year, does not have to be managed the same way as a perennial pasture. Perennial pastures, just like a hay field, needs time to re-grow after each grazing. This gives them time re-grow leaves and roots and to replenish energy stored in the lower parts of the plant (by photosynthesis).

Leaving animals in the same pasture or returning them to a pasture before it is fully re-grown does not give plants time to recover. Repeated grazing, without adequate time for regrowth, results in plants that weaken, may stop growing and die. Weak plants will not be able to compete with weed species, and won’t be able to hold the soil as well, resulting in bare soil and erosion. Some grasses and clovers will survive by staying very short, never growing tall enough for livestock to easily graze, while other areas in the pasture will be rejected by livestock, soon growing up into weeds, brush or small trees.

With good grazing management, livestock are usually moved to a new pasture several times a day, or at least every 3 days. Livestock are then not returned to the pasture until it has fully recovered to the ideal pre grazing height. The actual height that is considered “ready” to graze will vary depending on the grazing plan and the plant species mix in the pasture. The goal is to graze the plants once they have had enough time to fully recover, but before they become over mature and less digestible.

**Regrowth periods are variable:** Regrowth periods are not fixed, they are variable depending on the season, temperature, rainfall or irrigation pattern. This variable re-growth period means that when pasture growth slows down during hotter drier times of the grazing season, the total number of acres needed to graze will have to be increased. If the number of grazing acres is not increased, the plants will not be getting enough rest, and dry matter intake by animals will drop, resulting in both poor animal and poor pasture performance. One of the most common mistakes in grazing is not adding additional acres as plant growth rates slow down.

**Over grazing damage:** Over grazing damage occurs when a plant is grazed before it is fully re-grown. This is one of the most common causes of declining pasture quality, increasing weeds, and uneven, unproductive pastures. In addition to damage caused by being grazed while still re-growing, plants can also be damaged by grazing too short. Leaving cattle in a pasture long enough that they graze all the way to the base of the plant can allow them to bite off some of the crown of the plant instead of just grazing leaves and stems.

### **Common situations that cause overgrazing damage:**

- Taking down the interior fences in fall or other times of the year to let cattle “clean up” pastures. Livestock do damage in two ways at this time of the year by 1.) grazing plants too short and 2.) re-grazing plants as they try to grow new leaves.
- Having a rotational grazing system with just 6-7 paddocks (or fewer), which are each grazed for 1 or 2 days throughout the grazing season instead of having a regrowth period that is varied as plant growth rates change.
- Leaving livestock in the pasture for more than 3 days in a row, or long enough to allow them to re-graze plants as they try to re-grow new leaves.
- Returning livestock to a pasture before it has had time to re-grow
- Using some pastures as the “lane” so they are constantly walking through pasture areas to get to other pastures or return to their water source.
- Not adding in additional acres to increase the length of the re-growth period during summer when pasture plant growth rates slow.

**Pasture Design:** When designing a new system, or improving an existing system, it can be helpful to start by calculating what size paddocks are needed to feed each grazing group for a day. There is a worksheet at the end of this article to calculate paddock size needed, based on the amount of dry matter required per cow and per grazing group. Once you know how many acres you need each day and the length of the required re-growth period, you can calculate total number of acres of pasture needed. Remember that the number of acres needed changes as the speed the pasture plants are growing changes.

Once paddock sizes and number of acres needed is known, the pasture system can be designed (or improved). Use a farm map or survey map of the farm to first understand how many acres are available for grazing. You can get a farm acreage map from your local NRCS office or websites such as <http://measurelotsize.com/>. Then, using colored pens and your map (and some common sense) you can decide where to put lanes, fencing, paddocks and water. When subdividing your grazing land, here are some suggestions:

- Put lanes on high dry ground - you may need improvement & maintenance on wet areas.
- Some areas on your farm will grow faster than others. Whenever possible, try to put fast growing areas in one paddock and slow growing areas in another.
- Consider topography, and if possible fence south facing slopes and north facing slopes in separate paddocks.
- Plan for some shade pastures, which can be grazed during hot weather.
- Try to provide water in each paddock so animals don't have to walk to find it.
- Put gates in the corner of the pasture closest to the barn.
- If irrigation is used on the pastures, the paddock shape and size will need to be based on what system is used to get the water onto the pasture.
- Attend pasture walks, read some grazing publications, visit other grass based farms and learn from their experiences

**Fence and Water:** Advances in fence technology make good grazing management much easier. You will need a good quality, low-impedance energizer that is well grounded, and perimeter fence which can conduct electricity with minimal resistance. Once you install it, be sure to test the ground to make sure it is large enough. Portable fencing (poly wire and lightweight portable posts) can be used to subdivide larger areas.

Water can be provided to cows in paddocks in several ways. Water lines can be buried, or you can just lay pipe on the ground along a fence line or a lane. Above ground water lines may cause water to heat up if not shaded in some areas, but finding leaks in an above ground system is much easier. Depending on the size of the grazing group, water tubs can be small and portable, or can be larger and permanent. It is less expensive to have a few portable tubs than a whole lot of permanent tubs. If piping water out to pastures is not possible, water can be provided using a large tank on a wagon, which is parked in the pasture. Wherever the

water source is, you will probably want to use a float valve to control water flow. To start with, try to be as flexible as possible with your fence and water system. You may change your set up a few times, and you may need to have flexible paddock sizes as your herd size changes and your pasture productivity increases.

## Pasture Improvement Tips

- Don't follow a set rotation. If one pasture grows faster than the others, graze it more often.
- Walk the pastures each week to monitor how fast plants are re-growing.
- Don't let animals back into an area until it has grown back.
- Don't let animals stay in one area for more than 3 days, 12 - 24 hours is far better.
- Move animals frequently to increase dry matter intake and improve pasture quality faster.
- Lock animals in each paddock so they can't wander back to the barn.
- Use a back fence to prevent "back grazing", so that animals don't over-graze favorite plants.
- Use irrigation if needed to maintain pasture plant growth.

## PART TWO: Worksheet for calculating paddock size & total acreage needed

This worksheet will help you calculate how large the paddock needs to be for one grazing group for one day and the total acres you will need. To use this worksheet, you need to know how many animals are in the grazing group, and how much pasture DM (dry matter) per animal you plan to provide.

**Line A: lbs of DM you intend to provide from pasture (lbs per animal) \_\_\_\_\_**

*For example if you determine that your dairy cows will each need 42 lbs of DM per day (total DMD) and you want to provide 30 lbs of DM from pasture, then you will plan on feeding 12 lbs of DM from hay and grain in the barn and you write 30 lbs on line A.*

**If you are certified organic, and need to calculate % DM from pasture:**

$\% \text{DMI from pasture} = (\text{lbs DM from pasture} / \text{total DMD}) \times 100$

**(Line A/DMD) x 100 = \_\_\_\_\_**

*In our above example, this would be 30 lbs/42 lbs times 100 which is 71.4% DMI from pasture. Now we know this herd is able to meet the organic rule for pasture DMI and we can go onto design a grazing system to provide enough high quality pasture.*

**Calculating Paddock Size needed to provide enough DMI to the whole group**

**Line B: number of animals in the herd or group \_\_\_\_\_**

**Line C: Total lbs of DM from pasture needed per day for the herd or group**

**This is line A (lbs of DM per animal from pasture) times Line B = \_\_\_\_\_**

*If the example we were using on the previous page was for a herd of 40 cows, each needing 30 lbs of DM from pasture each day. Then Line C would be 30 lbs x 40 cows = 1200 lbs of DM per day*

**Line D: number of lbs of DM AVAILABLE per acre in the pasture \_\_\_\_\_**

Line D is the number of pounds of dry matter available to graze per acre in the pasture. This can be measured or estimated in a number of different ways. The best way is to directly measure available DM per acre using a grazing stick or other pasture-measuring device. For information on how to use a grazing stick you can go to <http://www.extension.org/> and watch the Video called "Calculating Dry Matter Intake in Organic Pastures using a Pasture Stick."

If direct measurement is not possible then an estimate can be done. In order to make an accurate estimate, the density of the pasture, height of the plants before grazing, and height of the plants after the cows have grazed them will need to be known.

Keep in mind that the actual pounds of **dry matter per acre at each height varies widely** with plant density and species - Attending pasture walks or discussion groups are a great way to learn how to make these estimates more accurately. This table was developed by Jim Gerrish, and is a useful way to estimate dry matter availability per acre. *For every inch of height in the pasture, this is the estimated dry matter yield in pounds.*

*(lbs pasture DM/acre-inch) – credit to Jim Gerrish for this table*

Stand density	Fair	Good	Excellent
Pasture Species	Lbs/acre-inch	Lbs/acre-inch	Lbs/acre-inch
Tall Fescue + N	250-350	350-450	450-550
Tall Fescue + Legumes	200-300	300-400	400-500
Smooth Bromegrass + Legumes	150-250	250-350	350-450
Orchardgrass + Legumes	100-200	200-300	300-400
Bluegrass + White Clover	150-250	300-400	450-550
Mixed Pasture	150-250	250-350	350-450

Example: cattle are turned into an Orchardgrass legume pasture of “good” density. It is 10 inches tall and they leave behind a 5 inch residual, they are harvesting 5 inches. 5 x 250 lbs = 1250 lbs DM available per acre

**Calculating Paddock Size:** to calculate the number of acres needed per day for the group you divide the required amount of DM by the available amount of DM per acre.

Paddock size (in acres per day) = Daily DM Required (line C)/ Available dry matter (line D)

**Line C/line D = Line E**

**Line E: number of acres needed per day \_\_\_\_\_**

*To continue our example, if there are 1250 lbs of DM available per acre, then the paddock size would be calculated by dividing 1200 by 1250 = .96 acres per day.*

*If it is easier for you to think of this number in square feet, there are approximately 43,560 square feet in an acre. So a .96 acre pasture is 41,818 sq feet. (.96 x 43,560). That’s a paddock, which is 200 feet by 209 feet on a side.*

**Calculating How Many Acres you need for the whole summer.**

Now that you know how many acres you need for the herd for one day, you can calculate how many acres you need to rotate through during the entire grazing season so you don’t run out of pasture. To do this you need to know the average pasture regrowth periods for your farm or area. You can find this information from your local Extension service, NRCS, grazing consultant or grazing network.

This table is set up so you calculate the number of acres needed each month of the grazing season. You will need to write in the months and the number of days of regrowth needed in each month.

MONTH	REGROWTH PERIOD In days	X	LINE E = Number of acres needed
_____	_____	X	_____ = _____
_____	_____	X	_____ = _____
_____	_____	X	_____ = _____
_____	_____	X	_____ = _____

*If our Example farm had a May regrowth time of 21 days, they would need 20.2 acres (21 days x .96 acres). In August, with a regrowth time of 30 days they would need 28.8 acres.*