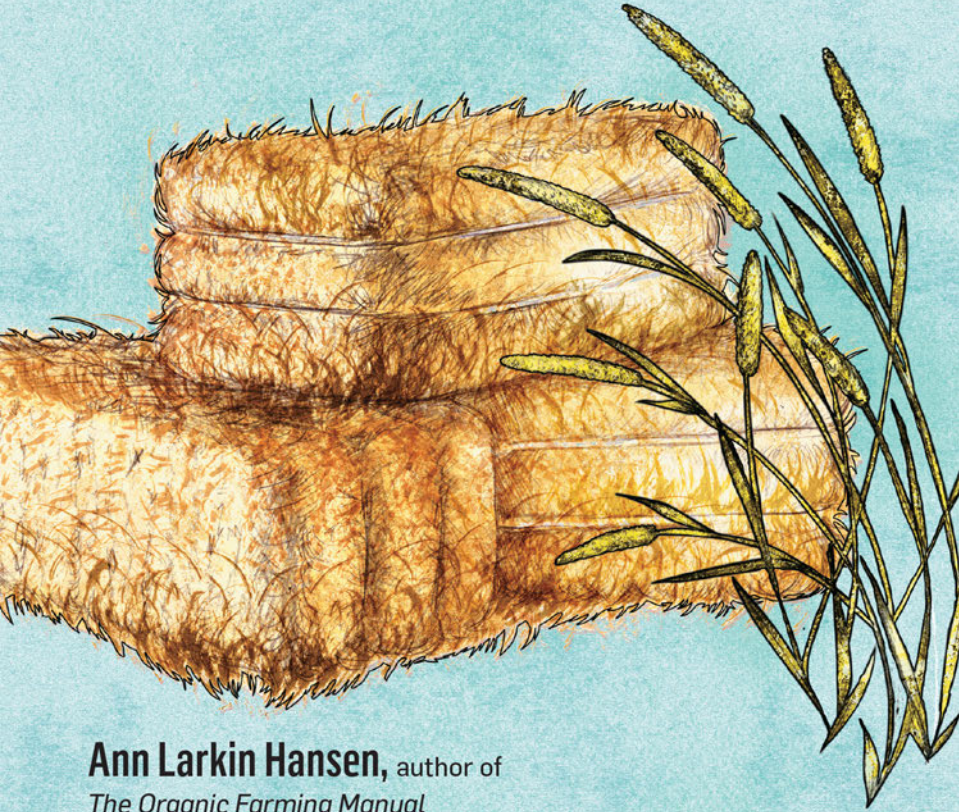


MAKING HAY

How to Cut, Dry, Rake, Gather, and Store
a Nourishing Crop



Ann Larkin Hansen, author of
The Organic Farming Manual



MAKING HAY

How to Cut, Dry, Rake, Gather, and
Store a Nourishing Crop

Ann Larkin Hansen



Storey Publishing

*The mission of Storey Publishing is to serve our customers by
publishing practical information that encourages
personal independence in harmony with the environment.*

Edited by Deborah Burns

Series and cover design by Alethea Morrison

Art direction by Cynthia N. McFarland

Text production by Theresa Wiscovitch

Cover illustration by © Lisel Ashlock

Interior illustrations by © Steve Sanford,
except for pages 8–12 in the public domain

Indexed by Samantha Miller

© 2014 by Ann Larkin Hansen

All rights reserved. No part of this book may be reproduced without written permission from the publisher, except by a reviewer who may quote brief passages or reproduce illustrations in a review with appropriate credits; nor may any part of this book be reproduced, stored in a retrieval system, or transmitted in any form or by any means — electronic, mechanical, photocopying, recording, or other — without written permission from the publisher.

The information in this book is true and complete to the best of our knowledge. All recommendations are made without guarantee on the part of the author or Storey Publishing. The author and publisher disclaim any liability in connection with the use of this information.

Storey books are available for special premium and promotional uses and for customized editions. For further information, please call 1-800-793-9396.

Storey Publishing

210 MASS MoCA Way
North Adams, MA 01247
www.storey.com

Printed in United States by McNaughton & Gunn, Inc.
10 9 8 7 6 5 4 3 2 1

Library of Congress Cataloging-in-Publication Data

Hansen, Ann Larkin.

Making hay / by Ann Larkin Hansen.

p. cm.

"A Storey basics title."

Includes index.

ISBN 978-1-61212-367-7 (pbk. : alk. paper)

ISBN 978-1-61212-368-4 (ebook) 1. Hay. I. Title.

SB198.H26 2014

633.2—dc23

2013040131

Take proper safety precautions before using potentially dangerous tools and equipment or undertaking potentially dangerous activities. Be alert and vigilant while operating heavy machinery.

Storey Publishing is committed to making environmentally responsible manufacturing decisions. This book was printed on paper made from sustainably harvested fiber.

CONTENTS

Introduction: Good Hay 1

CHAPTER ONE: **Judging** 5

CHAPTER TWO: **Cutting** 15

CHAPTER THREE: **Drying** 36

CHAPTER FOUR: **Raking** 48

CHAPTER FIVE: **Gathering** 55

CHAPTER SIX: **Storing** 69

CHAPTER SEVEN: **Problem Solving and Planning** 79

Appendix 86

Glossary 87

Resources 89

Index 91

ACKNOWLEDGMENTS

Thanks to Denny, Randy, Nathan, Elijah, Jonathon, Kelly, Pat, and Mike for many years of lending a hand when needed, and the mechanics at Badger Sales for all the advice, help, and assistance with repairs over the years. It takes a neighborhood to make a farmer, and I have great neighbors. Thanks also to our three boys, Nick, Phil, and Joe, for all the bales they moved, and to my husband, Steve, for everything.

— ALH

GOOD HAY

Hay in the barn is like money in the bank: it keeps well and makes you feel secure. A full loft guarantees that your livestock will be well fed through cold or drought or flood. Making your own hay isn't very complicated; folks have been doing it for many centuries without any formal instruction, learning what they needed to know from their relatives and neighbors. If you're reasonably observant, have a modicum of mechanical ability, and possess some common sense, you can learn to make your own hay.

Hay is composed of grasses and legumes (generally clovers) that are cut while green and growing, dried, and then stored for livestock feed for times when it is too cold or dry for pastures to provide grazing. You can make enough hay from your lawn with hand tools to feed a rabbit or two, or you can use mechanical equipment and cut many acres to feed a herd of cattle. Scale doesn't matter; the process is the same.

There are five steps to making hay:

1. Cut (mow)
2. Dry
3. Rake into windrows
4. Gather (loose or baled)
5. Store

The best hay is made by cutting the crop when it's young and leafy, then drying and covering it before any rain falls on it. Because the weather often doesn't cooperate, hay makers frequently have to choose between rain damage on young hay and waiting for good weather when it's too mature to make really good hay. Sometimes you lose twice and it rains on late-cut hay. In most years, though, if you pay attention to the weather forecasts and have your equipment in good shape, you'll be able to put up good hay.

You can make hay from many different species of grasses and legumes, although they vary considerably in yield, tastiness, and nutritional value. You can even make hay from small grains (technically grasses) and some other annual crops by cutting them while still young and green rather than when golden-ripe. Since different plants (and different varieties of the same plant) grow well or poorly depending on the soil and climate, ask your neighbors, agricultural extension agent, and seed dealers which ones do best in your area before planting a hay field. But quite often, instead of laying out a lot of cash on seed, you can start by simply cutting what is already growing in the pasture.

Traditional Haying Terms

Aftermath. The new growth after the first cutting of hay, from the Old English *math*, meaning to mow

Haycock. A small mound of hay made with hand tools to hasten drying

Haymow. The part of a barn where hay is stored

Hayrick, or haystack. Large, carefully constructed pile of loose hay with a temporary roof or thatch to protect it, for outdoor hay storage

Headlands. The ends of a field, where equipment is turned to start down the next row

Swath. The row of cut hay, before it is raked

Windrow. The row of cut hay after it is raked

That's the simple overview. The details can become a little complicated. In the next five chapters we'll walk through some of the intricacies involved in making nutritious, palatable hay suitable for the type of livestock you are planning to feed.

There will also be some excursions into related topics, such as:

- equipment options
- determining how much hay you might need
- strategies for dealing with common problems such as rain and breakdowns
- alternatives to making your own hay, such as hiring custom workers or trading part of your crop for someone else's labor

A book, however, can take you only so far. Some hands-on experience is necessary to complete your education in how to make good hay. Your farming friends and neighbors can show you those hard-to-describe-in-words details like how to twist a hank of hay to see if it's dry enough to bale, how to make the ends of your windrows tidy, and how to avoid plugging the baler pickup. Offer to give them a hand the next time they make hay.



ALL HANDS ON DECK: Baling small squares and stacking them on a haywagon

JUDGING

There are two ways to evaluate hay quality: the traditional method of looking at, feeling, and smelling the hay; and the scientific method, employing chemistry to determine the percentage of neutral detergent fiber, total digestible nutrients, and other precise measures of plant components.

If you are concerned about balancing livestock rations precisely, have your hay evaluated at a forage-testing lab to find the numbers for calculating the feed ration mathematically. (See the appendix for a brief discussion of how hay quality is defined and measured in the laboratory.)

If you're interested just in getting your livestock comfortably through the winter, it's fine to judge hay with your senses, the same way most small-scale farmers still do. Good hay is leafy, has a faded green color, and smells sweet and good. If it's had rain on it the color will be more toward brown and the smell of it a little sour.

Never judge hay by the outside of a bale or a pile; if you didn't make it yourself, you must look inside. Break open two

or three small bales, or wiggle your hand deep into a couple of round bales. If the hay seems glued together, it was baled too wet, and it heated. This means there have been some nutritional losses, making moldy spots more likely.

If you are buying hay, don't commit to a purchase until you've taken some home and made sure your animals will eat it — even if it looks good to you, inside and out.

Flavor and Nutrition

Palatability and nutritional value depend on the species of plants in the hay and, more importantly, on how mature they were when cut. Once you've looked at a few lots of hay you'll be able to make a pretty good assessment of the proportions of grasses and legumes, and how old they were when cut, although your livestock have the final say on palatability.

Flavor and nutrition also decrease every time it rains on the hay while it's drying in the field. Depending on how much rain fell and when in the haying process it occurred, the loss in quality will vary considerably.

Poor hay, however, is better than no hay. The necessary roughage for your livestock will still be there; you can usually make up any nutritional deficits by feeding concentrates such as grain.

Fitting the Hay to the Animal

With all that said — about hay of the very highest nutritional value and palatability — having the very highest-quality hay is not appropriate for most livestock. If we lived on nothing but

steak and chocolate, we'd get sick; so will your livestock if their diet is too rich. Although high-producing dairy animals need superb hay, most other species and classes (*class* is a shorthand term for the categories of age, sex, and end-use found in each livestock species) don't require such perfection. In fact, that kind of hay may do them more harm than good by upsetting their digestion or causing other ills. Your decisions on which forage plants to make into hay and at what maturity to cut them should start with what is best suited to your livestock and your farming methods.

Good Hay and Not So Good Hay

Good hay, or to use a more precise term, **high-quality hay**, looks green and smells good. Scientifically speaking, high-quality hay is defined as being very palatable to your livestock (tasty) and nutritious enough to supply most or all of the fiber, carbohydrates, and protein they need to thrive.

By this definition, the highest-quality hay consists of pure legumes (most commonly alfalfa), cut before blossoming, and baled with no rain on it.

Poorer-quality hay, on the other hand, is anything that has few leaves and many coarse stems, or contains seed heads due to being cut when overmature. It may be dusty, brown from long storage or from being rained on, and moldy.

SPECIES OF GRASSES AND LEGUMES COMMONLY USED FOR HAY

MOST HAY IN NORTH AMERICA is made from perennial forages (plants eaten by grazing animals) and classed as one of three types: legume, grass, or mixed.

Legumes

With the ability to extract nitrogen from the air and fix it in the soil, legumes provide for free the nutrient that growing plants need in the largest quantities. Perennial legumes commonly used for hay include the clovers and alfalfa. In general, these legumes are very palatable, as well as being easier to digest and higher in protein than grasses (although grass cut young can beat a legume cut old). Pure legume hay, however, may be too rich for many types of livestock.

ALFALFA

General characteristics: The most widely grown legume hay in North America with the highest potential yield of all legumes. Several species and probably hundreds of varieties are available. Best adapted to light to moderate soils (sandy to loamy) and needs good drainage and a neutral pH. Grows well anywhere in North America except the far South.



Palatability: Considered very palatable, although given a choice my beef cattle will graze grass first and leave alfalfa for last.

RED CLOVER

General characteristics: Best adapted to northern states, but some varieties available for more southern areas. Tolerates more acid soil and poorer drainage than alfalfa, so if you have heavier, wetter soils, red clover might be the better option. Lower growing, thus produces less volume than alfalfa. Hard to dry and prone to mold.



Palatability: Very high

Other Legume Species Commonly Cut for Hay

Note: This is just a sampling and not by any means a complete list.

Birdsfoot trefoil. Hard to establish, but persistent; makes very palatable hay. Adapted to cool climates. Use a tall-growing variety.

Crimson clover. Better adapted to the southern states; otherwise similar to red clover.

Lespedeza. Both annual and perennial varieties can make excellent hay. Adapted to a wide range of soils but grows better than any other legume on acidic, sandy soils, so is particularly useful in the Southeast. Does not tolerate cold winters.

Grasses

Grasses are adaptable to a broader range of soils and climates than are legumes, but they need added nitrogen (manure is excellent for this) to remain vigorous. Around 1,500 species of grass are native to North America, not to mention those that have been imported. Grasses most commonly planted for hay in North America include timothy, brome grass, orchard grass, and tall fescue; many others are used for hay in different regions.

Although generally lower in nutritional value than legumes, grasses work better for long-term hay fields and provide better wildlife habitat (think grassland birds) than do stands of pure legumes. Forage grass species vary considerably in palatability, with brome grass and timothy near the top and redbud at or near the bottom. Grasses also dry faster than legumes and are less likely to mold. For the highest-quality hay, grasses should be cut before the seed heads appear; if cut before flowering, many grasses can equal legumes in caloric content.



BERMUDA GRASS

General characteristics: A very leafy grass adapted to the Deep South. Prefers heavier soils, but will grow on almost any fertile, well-drained soil. Must be burned each spring to maintain the stand. Use a hybrid variety adapted for hay.

Palatability: High



SMOOTH BROMEGRASS

General characteristics: One of more than 40 species of brome grasses found in North America, and the one most commonly grown for hay. A long-lived, sod-forming grass best adapted to regions with moderate rainfall and moderate summer temperatures, though varieties are available for more southern or northern climates. Prefers fertile, moist, well-drained loam over clay loam soils. A good grass to combine with alfalfa.

Palatability: High

ORCHARD GRASS

General characteristics: A bunch-type grass, widely adapted as long as there's enough moisture. Tolerates heat and humidity better than do timothy or brome, but is less cold tolerant than either. Does best on fertile, medium soils, but will grow on both heavier and lighter soils. Grows well in combination with legumes.

Palatability: High



TIMOTHY

General characteristics: Adapted to cool, humid climates and very winter-hardy, but doesn't tolerate heat or drought well, so generally grown in the northern half of the United States and in Canada. Tolerates a wide range of soils. Can accumulate nitrates when stressed by drought, so if the hay was cut after a dry period it should be tested for this toxin (consult an experienced neighbor or your extension agent regarding whether to test, and who should do it). Always leave 4 to 6 inches of stubble for quick recovery and winter insulation. Grows well in combination with alfalfa or red clover.

Palatability: High



Mixed Hay

Mixed hay combines legumes and grasses. A mixed stand (of the right species) produces very palatable and nutritious hay that dries fairly quickly and suits just about any livestock. The legumes provide nitrogen and the grasses help the stand stay vigorous and hold the soil better. If possible, the maturity rate of the legume should match that of the grass or grasses so cutting can take place at the optimal time for both.

Don't let all of this technical information on forage species, palatability, and nutritional value intimidate you; what most of us small-scale livestock owners really need to know is that a

Other Grass Species That Can Be Cut for Hay

Note: As with legumes, this list is just a sampling and not by any means complete.

Big and little bluestem ("native grass" or "prairie grass"). Big bluestem makes highly palatable hay if cut young; little bluestem is more drought resistant, but difficult to cut young enough for palatable hay

Crested wheatgrass and other wheatgrass species. Adapted to cool, dry areas and a wide range of soil types. Good volume and excellent palatability if cut young

Fescue. Of the 100 or so species in North America, tall fescue is the one most commonly grown for hay. Less palatable than bromegrass, orchard grass, or timothy, but adapted to a variety of soils and both wet and dry conditions

Quack grass. A familiar species of wheatgrass which doesn't grow a lot of volume but makes highly palatable hay

Redtop. Best adapted to the Southeast, especially wetter soils. Low in palatability

Switchgrass. Most common in the southern half of the Great Plains states. Good volume and palatability

mixed grass-legume hay, cut reasonably young, is excellent for most animals. In fact, you could probably take a weed-whacker out tomorrow and make fine hay from your lawn without fretting about what kind of grass you were cutting.

The joy of making hay lies not in knowing its exact protein level, but in the rhythm of the mowing, the rustling sound of the raking, the breeze in your face, the swallows dancing around you, and the indescribable, incredibly sweet smell of fresh-cut hay on a warm summer evening. May the sun shine on your hay making.

More Information

For more information on forage species and varieties suited to your soils and climates, there's usually no better place to start than with your state's agricultural extension service website. For an excellent clearinghouse website that provides a broad range of information on all aspects of forages, as well as links to other sites, visit Oregon State University's Forage Information System (see Resources).

CUTTING

Dad always used to say “preparation is nine-tenths of the game.” And so it is with making hay. Before you start cutting, do some strategizing about when and why, and make sure whatever you’re mowing with is sharp and ready to go. This forethought will make all the difference in your chances of beating the weather and putting up a hay crop at the right time in good condition.

TIMING: VOLUME VS. QUALITY

THE BASIC DILEMMA FOR THE HAY MAKER is whether to cut early for the highest quality or cut late for the highest volume. The best solution for most of us is usually somewhere in the middle — if the weather cooperates.

Successive Cuttings

A second consideration is whether you want to make the first cut early enough in the season to allow the hay field to regrow for additional cuttings before winter stops growth. The rate of regrowth depends on forage species, amount of rain, and warmth. Irrigated alfalfa is generally cut every four weeks, while in arid areas of the West there isn't enough rain for more than one cutting per year.

The number of cuttings also depends on the farmer and what he or she is raising. In my area, some beef producers take a single cutting per year, while the most ambitious dairy farmers aim for four cuttings in four months. Earlier and more frequent cuttings are best if you're aiming for really high-quality hay, while cutting a little later and a little less often will give you more volume and less work. Also consider that later cuttings are usually much lower in volume than the first cutting, but are finer and leafier and so generally of higher quality.

Plant Life Cycle

When in the plant's life cycle should you cut? Here are some rules of thumb.

Hay cut young, just before flowers appear, will be at its peak for palatability and nutritional value, but not so high in volume. The most nutritious part of hay is the leaves.

Hay cut when legumes are in full bloom and grasses start to show seed heads will produce good volume, though with somewhat less nutritional value.

Hay cut when the seeds are fully developed won't have much more volume than at bloom stage, and much less feed value. Your livestock won't eat as much because it doesn't taste as good as the younger hay with more leaf and less stem. On the other hand, if weather or equipment problems have delayed your hay making to this point, it's still worth doing: old hay will still feed your livestock, though you may have to supplement their diet with some concentrates for good nutrition.

The Weather Factor

In much of the country, waiting until a little later in the season to cut means the weather is more likely to cooperate. Waiting often makes sense, since rained-on young hay can be less palatable and nutritious than older hay with no rain on it. Rain on cut hay also means more work: there's a lot more fussing around with tedding (see page 42) and raking to dry it thoroughly, and there's a much higher chance of mold and combustion in rained-on hay.

WHEN TO CUT

FOR MOST LIVESTOCK OWNERS, the decision to target an earlier or later first cutting is determined by the type of livestock they have. Here are some guidelines.

- Dairy animals produce best on the very highest-quality hay — cut while very young and leafy.
- Meat animals that you're trying to put weight on during the winter do best on good-quality hay.

-
- Most horses need only moderate to good quality, but their hay must be free of mold.
 - Beef cows don't need high-quality hay and, in fact, will probably winter better on hay that's cut later. The higher carbohydrate content of that type of hay requires a lot of digestive power, which keeps the rumen pumping out heat from all the work. This helps keep the cows warm.

Overall, a mixed hay that's not cut too young is fine for most livestock on most small-scale operations. This will usually be the best option for the farmer who wants both a decent yield and good-quality hay with the least amount of labor and worry about the weather.

Species by Species

Different species of forages have different optimal cutting times. A few are given below.

ALFALFA

Make first cutting when plants are in full bud, subsequent cuttings at one-tenth bloom. Leave a minimum stubble height of 3–4 inches.

BERMUDA GRASS

All cuttings can be made when plants are 10–15 inches tall, or before lower leaves turn brown. Leave a minimum stubble height of 2–3 inches.

RED CLOVER

Make first cutting at one-quarter to one-half bloom, subsequent cuttings at early bloom. Leave a minimum stubble height of 3–4 inches.

TALL FESCUE AND ORCHARD GRASS

Make first cutting at boot stage (see diagram next page), subsequent cuttings at boot stage to early flowering. Leave a minimum stubble height of 3–4 inches.

TIMOTHY

Make first cutting at boot stage, subsequent cuttings at boot stage to early flowering. Leave a minimum stubble height of 3–4 inches.

Source: USDA-NRCS Tennessee Job Sheet No. 511, "Forage Harvest Management, Conservation Practice"

Time to Start Cutting

Once you've observed how fast the crop is coming along this season and decided whether you'll try for an early cutting or wait for more volume, it's time to prepare your equipment and start paying close attention to the weather forecast.

In most of the country, what you're waiting for is four to five days of sunny, warm, moderately breezy weather with relatively low humidity. If you live in an arid region, you will worry

sample content of Making Hay: How to Cut, Dry, Rake, Gather, and Store a Nourishing Crop. A Storey BASICS® Title

- [click Computation and Storage in the Cloud: Understanding the Trade-Offs](#)
- [read online Excerpts from The Rubaiyat of Omar Khayyam Explained \(Moments of Truth, Volume 1\) here](#)
- [Dead Street pdf](#)
- [read *The Evolution of Adam: What the Bible Does and Doesn't Say about Human Origins*](#)

- <http://www.netc-bd.com/ebooks/MAKE--Electronics--Learning-by-Discovery.pdf>
- <http://www.netc-bd.com/ebooks/Garlic-and-Sapphires--The-Secret-Life-of-a-Critic-in-Disguise.pdf>
- <http://anvilpr.com/library/United--Thoughts-on-Finding-Common-Ground-and-Advancing-the-Common-Good.pdf>
- <http://academialanguagebar.com/?ebooks/The-Evolution-of-Adam--What-the-Bible-Does-and-Doesn-t-Say-about-Human-Origins.pdf>