

Small-Scale Livestock Production

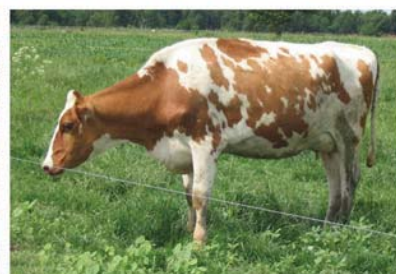
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Contents

Concerns with Raising Livestock on Limited Acreage	2
Species Considerations	6
Bees	6
Poultry	12
Rabbits	23
Hogs	27
Sheep and Goats	31
Cattle	40
Summary	41
References	42
Resources	42
Appendix: Species Budgets	49

Livestock is a potentially profitable enterprise for small-scale agricultural operations. Livestock can offer a farm new revenue streams as well as increased fertility and weed control. Benefits and challenges of raising livestock on a small farm are discussed here, including particular considerations related to producing poultry, rabbits, hogs, sheep and goats, bees, and cattle. Resources for further reading are provided.



Livestock offer many benefits to a small-scale farming operation.

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Introduction/Overview

With growing interest nationwide in sustainable agriculture and local foods, there are many opportunities for those interested in small-scale agricultural operations. Many beginning farmers or farmers in more urban areas do not have access to large parcels of land. Fortunately, there are many agricultural enterprises that lend themselves to small-scale intensive production.

Many small-scale farming operations have a vegetable crop focus. With a limited land base, high-value specialty crop production is a logical choice. However, don't overlook livestock as a possible enterprise for small acreages. There are many benefits to raising livestock on a small scale.

Livestock make a great addition to a specialty crop operation. In addition to helping diversify enterprises and income streams, livestock can provide many other benefits. For example, their manure can be used to fertilize crops. They can provide weed control in (geese) and around

(sheep, goats) gardens. Waste produce can be fed to livestock, and the animals can graze and fertilize gardens at the end of the season. This provides nutritious feed to livestock and helps eliminate garden waste.

In addition to providing benefits for the farm, adding livestock to your operation can benefit your community. There is a growing demand for locally grown food, but in many places, finding locally produced livestock products is difficult. By raising livestock and marketing their many products, you can help diversify the local-food offerings in your area.

Another benefit, especially if you are direct-marketing your farm products, is that livestock may attract customers to your farm. Customers enjoy seeing livestock on a farm. If your animals can be seen from a road, it may cause potential customers to stop and learn more about your operation. Additionally, the small size of sheep, goats, rabbits, and poultry make them relatively child-friendly.

Concerns with Raising Livestock on Limited Acreage

While there are many potential benefits from adding livestock to a small-scale farming operation, there are also many challenges.

First of all, you will need to investigate the zoning laws where you live. Are you allowed to raise livestock? If so, are there any limitations on type or number? For example, in an urban or suburban location, you may be allowed to keep as many as 20 hens but no roosters. Find out about any restrictions up front. It may be possible to petition to have the zoning changed, but this will require at least the support of your neighbors and the zoning board. It's best to learn about any restrictions before you begin an enterprise.

If you are new to livestock production, it is important to learn as much as you can before beginning your enterprise. Learning from other livestock producers is a great way to educate yourself about a particular enterprise. Unfortunately, in areas where farming is no longer common, it can be difficult to find mentors and advisors. Although reading can be a helpful way to learn about many aspects of raising livestock, not everything can or will be covered in

an article or book. Finding an experienced person who can answer questions or come and look at your setup and give guidance is worthwhile. A supportive veterinarian or local Cooperative Extension or NRCS agent can be a great help. An experienced local producer who is willing to spend time with you is a huge asset as well. Beginning farmers can often “pay back” these mentors by bartering their own time (labor) or other products and by serving as a mentor to someone else in the future. See the **Resources** section at the end of this publication for a list of books, periodicals, and organizations that offer education to assist you in your pursuit.

Installing housing and fencing is another task that needs to be done before bringing livestock to your farm. It is certainly true that “good fences make good neighbors,” and learning about the appropriate fencing for your chosen livestock species, and installing that fence, is an important step before purchase. Fencing is important not only as a means of containing your animals but as a way to protect them from predators, including neighborhood pets. For some animals, such as sheep or goats, fencing will be the largest single investment a producer makes. Visiting other farms and consulting with other farmers can help save time and effort and money. Remember that for a long-term investment, it's best to buy quality. It is also wise to begin with a temporary setup (be sure it adequately controls the animals) until you can see how it works. Invest in permanent fencing when you have some confidence in the design and location of fences and gates.

Fencing is probably the largest investment initially, with feed usually the largest ticket item in the long run. Feeding an animal correctly (the right amounts of nutritious feed) and economically is often a challenge, but proper nutrition is essential for health and productivity. For some species, such as chickens, providing adequate feed can be pretty simple: buy a feed labeled for the animal and follow the directions on the label. By contrast, for grazing animals you will need to learn to manage forages and then provide supplemental feed as needed. Finding an advisor and learning to monitor body condition (level of fatness; how much the bones are covered over the back and ribs) are important means of making sure your animals are receiving adequate nutrition. Feed costs may

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Evaluating a Rural
Enterprise

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be influenced by the location and scale of your business—you won't be purchasing feed by the ton, so you lose some efficiencies of scale. A suburban area may have higher costs for feed than a more rural area. Check into costs where you are and be sure to account for feed costs in your budget. In some areas, feed costs may prohibit raising some species of livestock.

For all livestock enterprises, feed and other costs will be incurred for weeks or months before any income is received. Cash flow during the first few years (or in an expansion year) can be a real problem. Also, either drought or a harsh winter can increase the need for purchased feed. Be sure to have a plan for paying for all expenses and think "worst-case scenario." What if you have to feed hay in July and August? What if an animal dies and you can sell only four hogs instead of five?

Most sustainable livestock operations will utilize forages as much as possible. Sheep, goats, and cattle are ruminants and should have a forage-based diet. Chickens, hogs, and rabbits can also utilize forage as a portion of their diets. The more you can utilize forages, the less feed you have to purchase. With a limited land base (five acres or less), access to adequate forage can be a challenge. It is important to understand how much pasture/forage you have available and what the realistic stocking rate is for your area and for the species you are raising. Often when livestock are being raised on limited acreage, they are more confined and fed purchased feeds such as hay and grain. Purchasing feed directly affects the profitability of your enterprise.

Purchased feed must be properly stored in a secure location and protected from rain and from animal contamination (e.g., rodents or cats). This preserves the nutritive quality of the feed and also protects animal health. If a ruminant breaks into the feed supply and overeats grain, it will get sick and may die. Cats may carry toxoplasmosis and spread the disease to your livestock or to the manager. Feed storage can be in a covered trash can in your garage, or you might need a separate shed for storing feed.

Grazing animals on a small acreage will sometimes need to be fed hay. In a dry climate, hay could be purchased and stored in stacks where livestock can't get to it. In areas where there is rain, hay will lose a lot of nutritive quality unless

it is stored under a roof. A tarp cover can protect hay from rain, but condensation will gather under the tarp, causing mold growth. In some instances, a hay grower may deliver hay in large bales or in small truckloads several times over the course of the season. Expect to pay extra for this service. If you have to haul your own hay, you will need a truck. Remember to allow time in your budget for acquiring, hauling, stacking, and feeding the hay. Ask your mentor how he handles feed acquisition and storage as well as feeding livestock.

Another concern of livestock production is manure handling. If you are raising animals on pasture, then you shouldn't have much of a manure issue, as they will be depositing their manure directly onto the pasture. If animals are being raised in confinement, or if they gather in a barn, then you will have to deal with manure. For sanitary and health reasons, it is important to keep barns and holding areas free of excess manure. Manure can be composted or applied directly to pastures and crops. Managing manure is not only important for the health of your animals but also for neighbor relations.

When choosing a livestock enterprise, take into consideration your local climatic conditions. If you live in an area with harsh winters, adequate shelters will be necessary. Harsh winters pose challenges in providing water to livestock and in young animal survival. Because of these concerns, it may be advantageous to raise animals that do not overwinter. For example, meatbirds are raised and harvested before winter. Feeder pigs also can be purchased in the spring and sold before winter. If sheep or goats are part of the farm, breeding can be planned so that lambs or kids are not born until springtime. Heaters for water tanks may be a good idea as well. Colder climates with shorter growing seasons also affect the amount of forage produced and how many months your animals can graze in a year. The shorter the growing season, the more feed you will have to purchase.

Hot weather also brings difficulty. Pastures stop growing, and animals eat less and can overheat and die. Internal parasite infections may rise to dangerous levels when animals are stressed by heat. Providing shade and cool, fresh water and being watchful for disease problems and for weight loss are good precautions. If heat is accompanied by drought, as is often the case,

For all livestock enterprises, feed and other costs will be incurred for weeks or months before any income is received.

managers will need to prevent overgrazing and provide supplemental feed if the pasture forage gets too short. Reducing the number of grazing animals on the farm or leasing extra land may also help the situation.

During all seasons, farmers must do what they can to protect the natural resources of the farm: the forages, soil, and water. Managing grazing, preventing access to pastures during severe droughts or very wet periods, keeping plant cover on land to prevent erosion, and managing manure and grazing to prevent water contamination are primary responsibilities of the land manager. See the **Resources** section for more information on protecting land and water.

Before you bring animals to your farm, try to locate (through asking neighbors, searching the phone book or Internet, or checking with your mentor) a veterinarian who will help if you have trouble. If you start with healthy animals and keep them adequately nourished and in a low-stress environment, you will usually have “good luck” with animals. Still, not all animals will stay healthy. What will you do if an animal gets sick or injured? While many areas have veterinarians nearby, not all veterinarians work with livestock. In addition to finding a veterinarian, you should acquire some books to learn the basic preventative health-care measures for the species you are raising and to learn something of the main diseases that may be a problem. Ask your local Cooperative Extension agent and your mentor about what diseases to watch for.

If you see an animal that is “not acting right,” it is important to act quickly to figure out the problem. In the first year or two, you will probably want to call your mentor to take a look at the animal. If he agrees that there is a problem and you need a veterinarian, call one; this is not only good for the animal but for furthering your education. Veterinary expenses may be higher some years as you run into problems, but if you learn from each experience, expenses should drop over time. Always ask how you might have prevented the problem: Is there a vaccine? Do you need to improve nutrition? Is sanitation adequate? Getting help promptly increases the chances of saving the animal and of preventing others from getting sick.

Another important concern is keeping yourself and your family safe. It is especially important

that you understand the risks of zoonotic illnesses and of injuries that might happen when animals are stressed. Learning about animal behavior and reactions—and proper handling—will help a great deal in making your livestock enterprises a good experience. Your mentor will be vital in showing you how to perform management tasks and how to safely work around the animals. Handling animals calmly and quietly helps. Always be cautious around these classes: males, females with young, animals that have not been handled (and so are afraid of people), and animals that have been handled too much (and so are not afraid of people). For example, a lamb that was cute and friendly when fed from a bottle will grow up to be a dangerous ram because it doesn’t fear or respect people. Similarly, a sow that was perfectly friendly and easy to deal with will be a different creature the day after she gives birth.

Even animals that are not aggressive can cause injury. A frightened sheep that is cornered could jump and knock down a child. There are ways to lessen risks; awareness is the crucial first step. Besides consulting your mentor, take time to read about the species you raise and learn safe handling. See http://safemanitoba.com/uploads/animal_web.pdf for a comprehensive (if scary) article on the subject. Also see <http://lamar.colostate.edu/~grandin/references/new.corral.html> for information about animal behavior.

In addition to locating a mentor, an advisor knowledgeable about soil and water conservation, and a veterinarian, a farmer will need to identify a couple of sources of labor. It is best if your family can help, and the responsibility of looking after animals is a character-building experience for children. But when you need to be off the farm for more than a day, you need someone to care for the animals. Willing neighbors, your mentor, responsible children from your local 4-H club or FFA chapter, and older farm-raised adults who have time on their hands are all good options. Plan to write complete instructions and to give your chore person a tour, giving verbal instructions. Leave them your cell phone number. And pay them well, in either dollars or some other compensation, as a competent and responsible person to fill in allows the farmers to have some freedom.

One of the side benefits of entering livestock production is that it will encourage you to get

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to know neighbors and build a network of connections to work cooperatively. Besides the helpers already mentioned, a small farm may need someone to haul livestock to a processor or market. They will need to locate a feed source, a fencing supply company, and someone with a tractor to help occasionally with clipping pastures or spreading manure. Talking with other producers is the best way to find those local people you will need to be successful. Joining an association of producers is a good use of time and energy. Check with your local Cooperative Extension office to learn of available groups or to get help in forming a new group.

In addition to finding support in your neighborhood, you will need to have good relations with your neighbors. You can help this along by communicating your plans, installing good fences to prevent your animals from making unwelcome visits, and taking good care of your farm so that it looks (and smells) healthy and attractive. This will mean composting manure, keeping the farm “picked up” (no old parts or tangled rolls of wire lying around), promptly dealing with mortalities by composting well, and keeping animals well cared for. If your neighbors are very close to your farm, they may be bothered by roosters or your guardian dogs. Be sure to control your animals and remember that an occasional gift of farm products or an offer to let the neighbors bring children over to pet the animals can help a great deal.

If you are raising livestock for meat, a prime consideration that must be investigated early in your planning process is the availability of processors to turn your animals into meat. Marketing options are contingent on the type of processing you can access. In many areas, this is the single largest stumbling block to raising and marketing livestock on a small scale. There are three levels of meat inspection: federal, state, and uninspected or custom-slaughter plants. State-inspected meat cannot be sold outside of that state, and uninspected meat must be for the owner’s use only and labeled “not for sale.” Federally inspected processing plants that are willing to take a small number of animals, or even keep your meat separate, are very hard to find. You might have to base your marketing on using state-inspected facilities or make arrangements with custom processors. A good option (if your customer wants an entire animal) is to sell the

animal live, transport it to the butcher for your client, and have the client pick it up and pay processing fees. Check with your state department of agriculture for your state’s regulations on processing, selling, and on-farm slaughter. Call the USDA Food Safety and Inspection Service hotline at 800-535-4555 with any questions about federal regulations. The Niche Meat Processor Assistance Network also offers information and resources about meat-processing regulations and contacts for locating a processor.

Table 1: Processing Options

There are several different levels of processing, and access to them will affect how you can market your animals.	
Federal- or USDA-Inspected Plants	Federal plants can process meat for nationwide sale.
State-Inspected Plants	Only about half of the states have a state inspection program. State-inspected plants can process any meat, but it is stamped for sale only within that state (unless the processor participates in the new USDA program that allows for interstate sale of specially inspected meat).
Custom Exempt Plants	A custom plant processes for individual use. The meat must be stamped “not for sale.”
On-Farm Slaughter (exempt from inspection)	Animals are processed by the owner for individual use. Regulations vary by state.

If you are planning a meat business, you must factor in the costs of processing, hauling the animals to the processor, and picking up the meat afterwards. It is possible that the processor’s share of the income will be more than yours. Remember that selling meat (or eating it) is not possible without someone performing this step, and a good processor is well worth the price.

Having determined your marketing options, you are now ready to think about the scale of the enterprise. Will you be raising livestock for home use only or for both home use and commercial production? Your family should agree on goals for the farm. Your goals and plans must factor in the reality of your farm. How much labor and how much land do you have? Do you

have a working knowledge of livestock, or is that one of the things you will acquire through your enterprises? It is wise to start with a small number of fairly inexpensive animals (“trainers”)—making sure they are healthy—and learn basic production and handling and marketing by raising just a few at first. This is a risk management technique: you will make mistakes but they won’t be as devastating. You will also learn whether you like the animals well enough to continue; if so, you can expand.

How much you can expand depends on your available land base. You must protect the forages, soil, and water of your farm. If you don’t overstock the farm, livestock can improve the forages and soil and therefore increase water retention on your farm. However, overstocking can deplete all the resources and contaminate the water. You must think of long-term consequences, not short-term gain.

How much income can you expect from your livestock? That depends on your choice of species and the way you manage and market them. Some rough indication will be touched on in the individual species sections of this publication. It is a good assumption that no livestock enterprise will allow you to get rich quick; use a sharp pencil and realistic numbers to figure out possible income and expenses. Budgets are provided, but you must always do homework to get figures for your own area. There are many things that can affect your profitability and income, including production efficiencies, feed costs, types of products, marketing streams, and what pricing your local area can support. These factors are different for all operations, which is why it is so important to keep records and determine the best products and pricing for your location.

That sharp pencil should be used all through your farming experience. Tracking expenses and income, observing yields, noting what market prices were for a certain date and a certain weight of animal, learning what your actual costs of production are, and noting labor use will all help in planning for next year and in adapting enterprises for better results. Keeping and reviewing good records is what will allow a small farm to be more than a hobby—and allow a farmer to determine whether it is a viable business, an enjoyable hobby, or a money pit. Each of those situations is possible with any livestock enterprise. Record-keeping forms can be found

in many production books (see **Resources**) or can be designed to fit your needs. These records are vital at tax time or whenever you are making decisions.

Once you have developed expertise with your animal enterprises, built your network of helpful people (mentors, processors, veterinarians, chore helpers, and vendors), and determined that you can make a profit with the farm, you may be ready to expand operations. Sometimes a neighbor will be willing to let you use their land if they believe your grazers will improve it, or someone nearby might lease you acreage. Adding land adds fencing cost and time, and perhaps travel time, and also presents the challenges of providing water and adequate observation.

Another possibility for increasing income might be to stack enterprises. For example, perhaps you could add sheep to your laying-hen operation, and let them graze ahead of the hens to keep grass manageable. A few pigs might be helpful to use extra milk and whey from your dairy-goat operation. Or you might diversify your product mix by selling breeding stock as well as meat animals.

Another potential way to add revenue to your farm is to add value to raw products. For example, make soap using some of the milk from your goats, process wool into yarn, or make hogs into sausage. Diversifying your product mix can also help you reach more customers and greatly increase your network and profits. Remember that each new product takes time, expertise, and possibly additional equipment, as well as marketing. Track time and expenses so you will know which diversification strategy was helpful and which was more trouble than it was worth.

See the **Resources** section for books, websites, and publications to further your understanding of managing a small farm that includes livestock. Some key considerations relevant to particular species follow.

Species Considerations

Bees

Small-scale intensive farmers are using small acreages to grow an abundance of food that is safe and sustainably raised. Many of them are beginning farmers with limited resources who are producing crops and livestock on small land bases. Others are

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currently farming on a larger scale and are starting to see the benefits of diversifying or downsizing their operations. Much of the success of all of these farmers is related to the pollination services of the honey bee (*Apis mellifera*). This section provides a general overview of keeping honey bees on a small-scale farm and includes legal and safety information on keeping bees in populated areas. Urban environments can provide excellent foraging for bees, with less exposure to the pests, diseases, and even pesticides that can be devastating to a colony.

The Value of Honey Bees

Over 150 crops grown in the U.S. are pollinated by honey bees, including many fruits, berries, nuts, melons, cucumbers, broccoli, clovers, and alfalfa. These crops make up one-third of the U.S. diet and contribute over \$14 billion to the U.S. agricultural economy (ABF, 2011). While crops such as blueberries and cherries are 90% dependent on honey bee pollination, almonds are 100% dependent on honey bees for pollination. Of the honey bee colonies in the U.S., two-thirds travel around the country each year pollinating crops during bloom time, including over one million colonies in California alone, just to pollinate the state's almond crop. According to the USDA's National Agriculture Statistics Service (NASS), there were more than 2.7 million colonies in the U.S. in 2010 (USDA-NASS, 2011). The honey bee is one of the most beneficial insects, yet colony numbers in the U.S. have declined 45% over the past 60 years (NAS, 2007).

In addition to the tremendous value honey bees provide as pollinators, they also provide agricultural products, such as honey, pollen, and propolis. Close to 200 million pounds of honey were harvested in 2010, with a retail cost of around \$1.75 per pound (USDA-NASS, 2011). While there isn't much money to be made selling honey on a small scale, there are several value-added products that can be made from the produce of the hive, such as candles and mead, a wine made with honey.

Starting an Apiary

The Legalities of Beekeeping

Prior to establishing an apiary, it is important to understand the legalities involved with keeping



Urban hive, New Orleans, Louisiana. Photo: Andy Pressman, NCAT

honey bees in your area. Many states require the yearly registration of hives through the department of agriculture. This may involve a yearly fee for a permit as well as an inspection for disease. For more information on registering bees, contact your state department of agriculture or visit the following web link for a listing of state agricultural services: www.easternagriculture.org/links/ag-services.html.

An inspection may also be required for transporting bees. Keep in mind when moving bees that if a hive is moved more than five feet from its original location, the hive must be moved at least three miles away so that field bees do not return to the old site and become lost (Sammataro and Avitabile, 1998).

A local municipality may also have its own set of rules and regulations for keeping bees. As more people become interested in keeping honey bees, many cities across the country have changed local ordinances to allow for keeping bees on a small scale. Whether the hives are located on a small-scale farm, in a backyard, or on a rooftop, local ordinances are created for the safety of the community, the beekeeper, and the bees. They specify the number of hives allowed, the types of hives that can be used, and where hives can be located. Bees that are kept in populated areas need to be managed appropriately so that they do not become a nuisance.

“Keeping bees successfully in a populated area requires an intimate understanding of basic bee biology, property rights, and human psychology” (Caron, 2000).

Related ATTRA publications

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Beekeeping/
Apiculture

Alternative Pollinators:
Native Bees

Beekeeping Support

Setting up a hive and maintaining bees can be an exciting and easy way to increase crop yields and expand production on your small-scale farm. As with any type of livestock, a number of issues can occur with keeping bees. These can range from protecting the hive from pests and disease to preventing swarms. In addition to familiarizing yourself with any local beekeeping regulations that may exist in your area, it is also important to have a good understanding of how to keep bees prior to bringing any bees onto the farm. There are many great resources available for education on bees and beekeeping. Manuals are good to have on hand, but there are also many educational courses offered. State and local beekeeper associations provide educational outreach and materials and offer updates on regional beekeeping concerns. In addition, they provide networking and mentoring opportunities where beginning beekeepers are matched up with an experienced beekeeper in their area.

Hive Location

Although local ordinances may dictate the location of a hive, particularly in urban areas, there are several factors to consider for locating hives. Honey bees can forage on pollen and nectar that are four miles away. It is important to consider how the bees may be a disturbance to neighbors. Consulting with immediate neighbors will help assure that the bees do not pose a risk or harm neighborly relations. This is also an opportunity to reduce fears and misconceptions about honey bees and to educate people on the crucial role honey bees play in food production. Neighbors will appreciate a jar of freshly harvested honey, so be sure to share your harvest, especially since the pollen and nectar may have come from their property.

Orientation

Bees are content and less aggressive in the sun. Orienting the hive entrance to the east or south

will increase the amount of direct sunlight for the day, especially during the winter months. Afternoon shade during the summer months will help to cool the hives, and this can be achieved by having a windbreak to the north. A northern windbreak will also provide protection to the hives from chilling winds and drifting snow during the winter months. Ventilation is a key component to hive orientation, and hives should also be kept dry. Placing the hives a few inches off of the ground will help with air circulation, and tilting the hives forward will help with water drainage. Using an Integrated Pest Management (IPM) Bottom Board, designed to monitor and reduce Varroa mite populations, is also a good way to increase ventilation and drainage.

When leaving a hive to gather food or water, bees will fly 3 to 6 feet above the ground. Having a hedgerow or fence that is at least 6 feet high will force the bees to fly above head level. A barrier can also be a “good neighbor policy” by keeping the hives out of sight. In addition, the use of a sturdy fence will help prevent curious children from exploring near the hives.

Water

Bees use fresh water to cool the hives and to dilute the honey that is fed to the young. During the warmer parts of the year, a strong colony of bees can consume over a quart of water per day. They tend to collect water from the nearest source, and once bees use a particular water source, they tend to continue using the same source (Caron, 2000). It is difficult to prevent them from returning to an undesirable source such as your neighbor’s swimming pool, pond, or bird bath. Providing a constant supply of fresh water close to the hives, starting in the spring when the bees start flying, can help prevent the bees from becoming a nuisance to your neighbors and reduce the chances of someone getting stung.

Rooftops

Many rural beekeepers keep hives on top of roofs to protect the hives from bears, and city rooftops also offer suitable locations for an apiary. The City of Chicago has maintained hives for over a decade on the roofs of City Hall and other municipal buildings. While having an apiary on a rooftop may prevent the bees from

becoming a nuisance to the neighbors, there are several other factors to consider.

First, the distance off of the ground and access to the roof are important aspects to a rooftop apiary. Keeping bees off of the ground requires equipment to be taken up and down. This can include supers that are full of honey and can weigh up to 40 pounds. In addition, the equipment that is taken to and from the hives may contain bees. Practice moving equipment to and from a rooftop prior to installing bees to get a general sense of what it will be like to manage a rooftop hive. Although there is little information available on the maximum height off the ground for hives, remember that the higher the hive, the harder bees will have to work on their return flights.

Second, the temperature of the roof and wind conditions are important considerations for rooftop hives. While the ambient temperature may not be a direct factor, the heat off of a roof will cause the bees to need more water. Providing a water source on a roof may be an inconvenience to the beekeeper, but otherwise the bees will have to collect and carry water up to the hives. Roofs can also be windy, and a windbreak may be necessary to protect the bees.

Hive Management

There are several management techniques that will help keep bees calm and nonaggressive. Bees tend to become aggressive—genetics aside—when there is a lack of pollen, nectar, and good weather to forage or when there is a disruption to the hive. Potential and common disruptions include inspecting the hives, animal odors, and vibrations such as those from nearby lawn mowers. Aggressive bees should not be kept in populated areas. Their behavior can often be dealt with by requeening the hive with a new queen.

Working the Hive

Once a hive is opened for an inspection or otherwise disturbed, the bees can become temperamental. A typical bee hive contains thousands of worker bees that are all capable of stinging. Once a bee stings, a pheromone is released to warn the other bees in the hive and trigger them to attack. Gently smoking the hive encourages



Rooftop hives at Penn State University. Photo: Andy Pressman, NCAT

the bees to engorge honey, which calms the bees and reduces the likelihood they will sting.

A hive's disposition is also influenced by the time of day and weather when the hive is worked. Bees tend to be more docile on warm sunny days and are more likely to attack when the temperature is below 65 degrees Fahrenheit or when it is cloudy or raining (Caron, 2000). Working a hive in the middle of the day is also preferred over the early morning or late afternoon. During this time most flowers produce their nectar, so the bees are active and out foraging. Rain dilutes nectar, and bees often wait to forage until the sun has evaporated the moisture, making the nectar more concentrated. One time not to work bees mid-day is when there is a dearth, which usually takes place between honey flows in the summer. This causes bees to rob other hives and makes bees defensive of their own hive. Spending a limited amount of time examining the hive and covering honey supers when robbing is prevalent will reduce the amount of robbing when there is little food available.

Swarms

Swarming is a hive's natural tendency to establish a new bee colony. Swarming usually takes

place in late spring when many of the worker bees (females), drones (males), and one or more queens leave the original colony to form a new one. During a swarm the bees are filled with honey and are usually gentle and not inclined to sting. Strong colonies with good laying queens are most likely to swarm. Preventing swarms (and knowing how to catch a swarm) will not only make sure that there are no colonies being established outside of the hive, but will also keep the hive strong and better able to survive through the winter. Swarm prevention can include the following:

- Providing sufficient room in the brood chambers and honey storage areas
- Reversing brood hive bodies
- Dividing the colony if there are queen cells
- Requeening the hive with a young queen
- Setting up a “bait hive” in hopes that the swarm will discover it

Factors Affecting Hive Health

With the rise of industrial agriculture and other stresses, bees have been struck with a multitude of pests and diseases that have caused extensive damage to the honey bee population. Pests include the parasitic Varroa mite, the tracheal mite, and the small hive beetle. Varroa mites feed on honey, brood,

and adult bees and have become resistant to chemical miticides over several generations. Organic controls are effective and require a good understanding of Varroa mites’ life cycle and thorough monitoring, especially during a honey flow. Diseases have infected both the brood and adult bees and include American and European foulbrood, Nosema, and Israeli Acute Paralysis (IAPV).

While most colony deaths since the early 1980s have been attributed to the parasitic Varroa mite, beekeepers have recently been experiencing losses associated with a crisis called Colony Collapse Disorder (CCD). CCD was discovered in 2006, when beekeepers observed few to no adult bees in hives with a queen, brood, and honey present. Honey bees leave the hive in search of pollen and nectar and do not return to the colony. Some beekeepers reported losses of 30% to 90% in 2006 and 34% in 2010 (CCD Steering Committee, 2010).

There has been no single agent discovered that is responsible for CCD, although there are major research studies being implemented, with the participation of the USDA Agriculture and Bee Research Centers, universities such as Penn State University, University of Nebraska, and the University of Minnesota, and countless numbers of beekeepers. Studies are indicating that pesticides, parasites, and pathogens are associated with CCD. In part, the use of genetically engineered crops with herbicide resistance has eliminated pollinator habitats from crop fields and field borders (Ellis, 2011). Secondly, the large deployment of neonicotinoid and phenylpyrazole pesticides known to kill bees has led to detectable levels of those pesticides in the pollen and nectar of plants. Beekeepers such as Gunther Hauk of Spikenard Farm Honeybee Sanctuary in Virginia and Ross Conrad of Dancing Bee Gardens in Vermont are sharing the wisdom of using organic and biodynamic beekeeping methods that do not undermine the bee’s immune system as a means of preventing CCD.

A Word about Grazing Livestock

Managed grazing can be beneficial to honey bees and other pollinating and beneficial insects. In order for managed grazing to be effective, the combination of timing, intensity and duration of each rotation, as well as the type and breed of livestock best suited for the site need to be



Small-scale commercial beeyard in Ohio. Photo: Andy Pressman, NCAT

in balance (Hoffman Black, Hodges, Vaughn, and Shepherd, 2007). Grazing periods should be short and planned around allowing flowers to bloom to provide nectar and pollen sources. Overgrazing livestock can be detrimental to bee habitat as livestock can damage soil structure and plant communities. For more information on rotational grazing, visit the NCAT Sustainable Agriculture Project website at www.attra.ncat.org.

Certification Standards for Beekeeping and Hive Products

As bees become susceptible to more pests and diseases, many beekeepers are practicing natural management techniques that eliminate the use of synthetic chemicals in the hive to help bees stay healthy. By following rules and regulations to meet specific certification standards, such as Organic and Demeter, beekeepers have the opportunity to certify their honey and hive products. Certified products, legally permitted to be labeled as such, can bring higher prices.

Organic Certification

Organic certification requires that beekeeping operations be in compliance with the rules and regulations set forth by the USDA National Organic Program. Bees are considered livestock, and the Livestock Standards, sections 205.236 through 205.239, and the related sections of the National List have been used as a baseline for certifying honey and other products from the hive. As with poultry, the standards require that bees be managed organically from the second day of life and fed organically produced feed; and that the beekeeper use no prohibited substances.

In the fall of 2010, the Livestock Committee of the National Organic Standards Board recommended that specific apiculture standards be added to the organic regulations. The recommendations ensure the continued success of the growing U.S. organic honey market and include the following practice standards (NOSB, 2010):

- A forage zone with a 1.8-mile radius from the edge of the apiary and a surveillance zone of a 2.2-mile radius beyond the forage zone where there is the risk of contamination are needed.

- Organic bee products must be from colonies and hives that have been under continuous organic management for no less than one year prior to the removal of the bee products from the hive.
- Hives must be constructed from non-synthetic materials, such as wood and metal, and not be treated with prohibited substances.
- Foundation may be sourced from organic foundation, plastic foundation dipped in organic or conventional wax, or organic or conventional wax.

Demeter

Demeter International is the world's only certifier of Biodynamic® farms and products. The 102 certified Biodynamic farms in the U.S. follow the principles of biodynamic agriculture that were presented by Rudolph Steiner in 1924 (Demeter International, 2011). Biodynamic agriculture envisions the whole farm as a "self-contained and self-sustaining organism" (Demeter Association, Inc., 2006). Refer to ATTRA's *Biodynamic Farming & Compost Preparation* for a general overview of biodynamic farming. The Demeter Standards for Beekeeping and Hive Products describe the management practices for the natural construction of comb, winter feed containing a minimum of 5% honey by weight, and methods for increasing honey production. Demeter Standards for Beekeeping and Hive Products is available online at http://demeter.net/standards/st_bees_e.pdf.

Top Bar Hives

Top Bar hives have been used for centuries, and their practicality and more natural approach to beekeeping is still favored by small-scale farmers around the world. Top Bar hives allow the bees to build their own comb and are an alternative to the standard Langstroth hives with movable frames. Top bar hives are gaining in popularity among beekeepers in the U.S., in part because they are easy to construct, relatively cheap to produce, and do not require any frames or supers. Top Bar hives tend to produce less honey, but that honey does not have to be extracted. Instead, honey is harvested as whole-comb and is either pressed or drained.

Overgrazing livestock can be detrimental to bee habitat as livestock can damage soil structure and plant communities.

There are two types of designs for Top Bar hives, the Kenyan and the Tanzanian. The designs are similar in that they both include a sturdy box with an entrance on one side, 20 to 30 top bars, and a roof. The difference is in the sides: the Kenyan style has walls that slope inward toward the bottom while the Tanzanian has straight sides. Both designs work well; however, bees tend not to attach comb to floors, and with the sloped sides of the Kenyan-style hive, bees think the walls are part of the floor and attach far less comb, making it easier to remove the comb.

Brood is built near entrances, so placing the hive entrance on one end for brood results in the bees filling comb with honey on the opposite end. Consequently, it is easy to harvest honey, and

no queen excluder is needed. A queen excluder is used in Langstroth hives, placed between the brood chamber and honey supers. It allows for worker bees to move throughout the colony but keeps the queen and drones confined to the brood chamber. As a result, the honey supers contain only honey—no brood—and can easily be removed for harvesting.

The key principle with Top Bar hives is making sure that the top bars are between 1¼ and 1½ inches wide. This is the proper distance apart to allow bees to build comb. In addition, a top bar length of 19 inches makes it convenient for starting comb and brood rearing in a Langstroth hive and later transferring it to a Top Bar hive. When starting a top bar, attaching ½ inch of beeswax, masonite, or hardwood to the top bar will help the bees start building comb in the right place. Many top bars have a groove down the center so that the starter can easily be wedged into the bar. When reusing a top bar, the starter can be achieved by leaving ½ inch of comb attached to the top bar when the rest of the comb is cut away during the harvest. Since top bars are not supported by a full frame, the comb is more fragile than in a standard hive. The comb should always face down and can be turned upside down, but should never be turned sideways.

For information on building a Top Bar hive, see the **Resources** section at the end of this publication.



Top bar for Top Bar hive. Photo: Andy Pressman, NCAT



Top bar with naturally drawn comb. Photo: Andy Pressman, NCAT

Poultry

Poultry are raised on the farm for many purposes – egg and meat production, insect and weed control, and selling stock are a few reasons. Due to the diversity of sizes, diets, foraging behaviors and hardiness among poultry species, poultry can usually be advantageously incorporated into an existing livestock or horticultural enterprise, with a synergistic effect with other farming enterprises.

Poultry has the potential to be one of the most profitable livestock species on small acreages. Poultry has several advantages over other livestock for farmers limited by land availability: the birds' small size, a fairly quick return on investment, and low cost of start-up, to name a few. In fact, poultry are often the first livestock that beginning farmers own and are frequently the “gateway” animal to acquiring larger stock.

Poultry can diversify a farm's offerings to customers through meat and egg production, provide insect and weed control, improve soils through increased fertility, and become a marketing and educational tool for customers and their children. There are many types of domesticated poultry with profitability potential on small farms:

- Chickens
- Ducks
- Turkeys
- Geese
- Guineas
- Squab
- Gamebirds (e.g., quail, chukar, and pheasants)

Each species has advantages and disadvantages that will be covered below.

Poultry Species

Chickens

The most familiar of all poultry, chickens were domesticated around 7,000 to 8,000 years ago and have fed billions of humans throughout the ages with their eggs and meat. On the farm, chickens produce eggs (layers) and meat (meatbirds or broilers). Some older breeds, referred to as dual purpose, produce eggs, and their carcasses put on enough meat to make a decent stew hen at the end of their laying productivity. Typically, however, layers and meatbirds are raised differently, as their management needs are quite distinct.

Layers

Historically, laying hens have been a common livestock component of American farms and homesteads. In 1910, when small farms covered the nation, nearly 88% of American farms maintained at least a small flock of chickens for commercial or family production. Laying hens are still the most common poultry on small farms.

Breed selection is an extremely important step in a profitable laying operation. Robert Plamondon, a long-time pastured poultry farmer in Oregon, estimates that modern breeds of laying hens, such as Red and Black Sex-links, Industrial Leghorns, and Production Reds, are



Commercial laying breeds, like this Commercial Leghorn, do just as well on pasture as their heritage counterparts. Photo: Carla Spencer, Across the Creek Farm

six times more productive than nonproduction breeds like Brahmas, Dominiques, and Orpingtons. Choosing the most productive breeds available can be like doubling or tripling your flock size in terms of production while cutting your feed, housing, and fencing costs to half or a third of what they would be with the more unproductive breeds.

In his book *Success with Baby Chicks* Robert Plamondon explains quite thoroughly the differences between various breeds and hybrid layers on pasture. He convincingly shows the necessity of using modern commercial utility layers, many of which are crosses between several breeds of chickens or independent strains developed within a breed. Examples of modern commercial layers include the following:

- Commercial Leghorns
- Sex-Links (Red and Black – Commonly called Red Star, Gold Nugget, Cherry Eggers, etc.)
- Production Reds (strains of Rhode Island Reds)
- California Whites

Older commercial laying breeds include the following:

- Laying strains of Barred and White Rocks
- California Greys
- Rhode Island Reds
- White and Brown Leghorns

Table 2: The Impact of Layer Breed on Net Income

Laying Flock Breed	Dz Eggs Per Hen	Sales @ \$3.50/dz	Feed Cost Per Hen	Return Over Feed*	Gross Profit**
Non-Commercial Breed	8	\$28	\$21.88	\$6.12	-\$2.58
1950s-Era Commercial Layer	16	\$56	\$23.75	\$32.25	\$22.35
Modern Commercial Layer	20	\$70	\$27.50	\$42.50	\$32.00

*Feed estimated at \$0.25/pound

**Gross profit is figured as return over feed minus the cost of egg cartons (\$0.15/dozen) and the cost of raising a pullet chick to maturity (\$7.50). *Source: Adapted from Robert Plamondon's Success With Baby Chicks.*

Unlike meatbirds, which have a turnaround as short as six weeks, production-strain laying hens don't start laying until their fifth or sixth month, each consuming approximately 25 pounds of feed before they reach the point of lay. As a hen ages, the number of eggs laid over the course of a year decreases. Therefore, after the hens' second year of laying, most poultry farmers remove these older, less-productive birds from their flocks. The investment in raising the hens to the point of lay is recouped by processing the spent hens for soups and stock or possibly selling them to families and homesteaders who want their own freshly laid eggs and are less concerned with maximizing profits.

Brown eggs typically fetch a higher price than white eggs because most customers identify brown eggs as higher quality, healthier, or more

“country.” In truth, the nutritive qualities of eggs are determined by what's inside the shell package. However, it's beneficial to plan for the consumer's bias.

A flock of layers can help even out the cash flow of a small farm, especially during the spring, when egg production is heavy while few crops are ready to be harvested. Winter typically brings a lull to egg production as hens molt and/or greatly slow down egg laying due to decreased sunlight levels. There are strategies for balancing out the wintertime dip in egg production by providing supplemental lighting or having a batch of pullets reaching point of lay during the winter months.

Processing and egg handling are critical components of any size laying operation. These subjects will be covered in more detail later in this section.

What about Roosters?

There are several common misconceptions concerning roosters in the flock. Is a rooster needed for hens to lay eggs? Are fertile eggs more nutritious? Are all roosters aggressive?

It turns out that a group of hens will lay eggs regardless of whether a rooster is present or not, as a rooster is needed only to produce fertile eggs. And about those fertile eggs—fertile eggs are no more nutritious than nonfertile eggs. Eggs are almost always gathered by the farmer and refrigerated soon after they are laid, and fertile eggs don't start developing unless they're incubated by either a broody hen or in an artificial incubator.

Many farmers keep roosters in the flock for reasons besides breeding. As the flock forages, roosters will watch over their hens, and a good rooster will constantly scan for ground and aerial predators (plus the occasional plane). A rooster will call his hens when he finds food, and many farmers feel that flocks with a rooster have less fighting because the flock's pecking order is more stable.

Roosters do have potential drawbacks. In urban environments excessive crowing may lead to conflicts with neighbors. Certain hens will become the male bird's favorites and will receive a good deal of his affection; the resulting treading from the rooster climbing on the hen's back can cause feather loss and even lacerations on the hen. Just like people, some roosters' personalities are pleasant and some are extremely pugnacious. Aggressive roosters should be culled immediately.

Meatbirds

On average, Americans eat more chicken (86.5 pounds) throughout the year than any other type of meat. Almost all chickens produced for meat in the United States are raised in Confined Animal Feeding Operations (CAFOs), but consumers are increasingly seeking truly free-range meatbirds raised on pasture. There's a demand for sustainably raised chicken, and many customers are willing to pay a premium for it.

Meatbirds are a nice complement to laying hens on a small farm. While laying hens provide a small stream of nearly constant income, meatbirds can inject slugs of profit. In the time that it takes to raise a flock of laying hens to the point of lay, a farmer can possibly raise two batches of meatbirds. Meatbirds also have the advantage of not having to be overwintered, and the short turnaround time allows the small farmer to take a break between batches of chickens.

A batch of 100 meatbirds raised with electric poultry netting in a spacious day-ranging system can be brought to harvest in just a few months on around 3/4 acre and would require even less land with a 10-foot by 10-foot movable pen. The birds could be worked into a crop rotation to fertilize and weed before tillage or to glean through crop residues and gobble pests post harvest.

As with laying hens, meat bird breed selection is extremely important. The Cornish Cross (CX), the champion of today's poultry industry, has been bred for the better part of the past century to do one thing – put on weight efficiently. Many pastured-poultry farmers use the CX because of its advantages: feed-conversion rate (amount of feed it takes to make a set amount of meat) and widespread availability due to the proliferation of poultry CAFOs across the countryside. The CX is their money maker. Other producers have problems with the CX, though, citing disadvantages of poor mobility, summer-time heat losses, poor foraging skills, and leg problems due to nutritional deficiencies in feed.

On the other end of the spectrum from the CX, heritage breeds are regaining popularity, and when good markets can be found, the birds' poor feed-conversion rates can be compensated by higher prices. Typically, though, such markets are difficult to find or build.

Fortunately, there's middle ground for the producer selecting meatbird breeds. Several types of



*Freedom Rangers on pasture at Across the Creek Farm in West Fork, Arkansas.
Photo: Leif Kindberg, NCAT*

birds with Hubbard (an international breeding company) genetics based on the French Label Rouge Free Range Program are now being raised in the United States. Depending on the family hatchery and particular strain of birds, various names exist – Red Ranger, Freedom Ranger, Redbro, and Rosambro, for example.

Pastured meatbirds are typically raised in either Salatin-style portable pens (described on page 20) or in day-ranging setups. Both systems have their pros and cons. Many producers start off with Salatin pens, with some producers moving to day-range systems because they can be less labor intensive.

Turkeys

Turkeys are a uniquely American bird, not only because they originated in America but also because Americans eat more turkey than any other country in the world. Turkeys are appealing to small-scale producers. Even a small batch of turkeys can earn a decent profit for a farmer. Except for susceptibility to a disease called Blackhead, turkeys are extremely tough once out of the brooder. In particular, turkeys at all stages are much more heat resistant than their chicken counterparts. Unlike marketing other poultry meat and eggs, selling turkeys focuses mostly around one day—Thanksgiving.

Turkeys can be divided into two groups – Broad Breasted and Heritage. Broad Breasted



Even a small batch of turkeys can earn a profit for a farmer. Photo: Margo Hale, NCAT

turkeys are the industry standard and are by far the most common turkey on the market. Most Broad Breasted turkeys are white, but there are also bronze varieties that are sometimes mistaken for heritage breeds. The product of intensive breeding programs and characterized by rapid growth and large amounts of breast meat, the Broad Breasted white does one thing extremely well: put on meat efficiently, although this is done at the expense of being able to reproduce naturally. These turkeys are quite hardy on pasture, and they are voracious grazers, eagerly consuming any vegetation and small animal pests that they can find.

Heritage turkeys differ from Broad Breasted turkeys in several ways. For the farmer, heritage turkeys are slower growing, and proportionally more dark meat is produced on the heritage frame. Feed-conversion rates for heritage poultry vary greatly depending on the breed and strain. Some heritage turkeys, once the industry standard, are good converters of feed to meat. The production disadvantages of heritage turkeys, such as lower feed conversion and a longer grow-out period compared to the Broad Breasted varieties, can be offset by their increased price. Heritage turkeys are a unique product, transporting the consumer to Thanksgivings and Christmases past, and many families are willing to pay a higher price to provide a special experience for the holidays.

Nearly a dozen heritage turkey breeds exist, and some are faced with extinction unless more people begin to grow them. The American Livestock Breeds Conservancy (ALBC) has a wealth of information on raising heritage turkeys, including a free downloadable manual. For more information see their website, www.albc-usa.org.

Ducks

Ducks and geese are extremely versatile and productive poultry on the small farm and homestead. These waterfowl have been important historically, producing eggs, meat, and feathers, and controlling crop pests for the families that raised them.

Meat and egg production are the primary reasons for raising ducks today. Ducks are relatively easy to raise because they are extremely hardy and resistant to the harshest weather and nearly all diseases. Whether raised for meat or eggs, ducks tend to make a mess of any water source they can find. While this behavior is not a problem in large ponds, ducks raised without access to open water will “make” a pond near any waterer, and the producer must plan on managing ducks for cleanliness.

Generally, chicken and duck nutrition is similar, except that medicated feeds should not be used for ducks due to potentially fatal sensitivities to some medications. Ducks are excellent foragers, using their bills to search for insects, slugs, and other small animals in mulch, grass, and other hidden places. For this reason, ducks can be used to great success in cropping systems removing damaging pests. However, besides insect and other animal pests, ducks will consume a large amount of plant material. The producer must ensure that the crops are not more appealing to the ducks than the pests they are being used to control.

Egg Production

While less popular than chicken eggs, duck eggs are similar; some describe the taste as “more eggy.” Duck eggs are often used in baking to deliver a richer, moister baked product. Many producers offer at least some of their duck eggs in half-dozen cartons, pricing the duck eggs similarly to a dozen chicken eggs. The higher price offsets the added hen cost, larger egg size, and

"We absolutely fell in love with raising (Peking) ducks due to their incredible hardiness ... then we started processing. After two hours plucking ducks, I was murmuring to myself something that rhymes with "plucking ducks." I shan't repeat it here. The efficient method that we have honed for processing our Cornish Cross meat chickens is completely lame when it comes to the ducks."

- Anonymous Pastured Poultry Farmer

extra labor collecting and washing eggs while taking advantage of their uniqueness.

Ducks' egg-laying habits are much different from those of chickens. Whereas chickens will search out nests to lay in, ducks are much less picky, often laying eggs out in the open. Nesting boxes should be placed on the ground, and if the ducks have access to pasture, it's a good idea to pen the ducks up at night and release them in the morning after they've laid most of their eggs. Penning the ducks will assist in egg collection and quality.

As with chickens, breed selection plays a large part in determining profitability in duck production. Good laying breeds are the Golden 300 Hybrid Layer, Khaki Campbells, and laying strains of Indian Runner ducks. The Golden 300 is a strain of laying duck developed by Metzger Hatchery in California. This strain produces a lot of eggs but will not breed true because they are crosses between multiple breeds and strains of laying ducks. Khaki Campbells and Indian Runners are stable breeds and will breed true to type.

Meat Production

Raising ducks for meat is much the same as raising chickens. The actual rearing of the ducks is relatively easy, because the ducks are so hardy. The white Peking duck is the variety of choice for meat production, efficiently converting feed and forage to meat. Unlike the Cornish Cross chicken, though, the Peking is not a hybrid and will breed true to type. The main challenge in duck production is processing, specifically plucking. Waxing, processing at specific ages, and special scalding/plucking techniques can help. For more detailed information on plucking waterfowl, call the National

Sustainable Agriculture Information Service at 800-436-9140.

Geese

Once a mainstay of American agriculture, geese were heavily utilized not only for their meat and fluffy down but also for grazing and mowing young weeds and grasses in row crops and lawn production. Weeder geese were replaced by herbicides starting in the second half of the 20th century, but there's still a place for geese on the small farm.

Unlike other poultry, geese can derive most of their nutrition from grazing high-quality grass if they get supplemental feed as goslings and when grass production declines. Their minimal input requirements mean that geese can potentially be raised on the farm with little expense. The functionality of geese is impressive: they provide weed control, produce Christmas meat, supply goose down, and provide security on the farm. Geese, especially Chinese geese, are extremely vigilant, and will sound the alarm whenever a threat is perceived. Geese can be used to protect other poultry, sheep and goats, or even the home or property. However, care must be taken to make sure that young children are not the victims of overly zealous geese.

While a market definitely exists for Christmas geese, the difficulty lies in processing them, and they will almost certainly have to be processed on farm. The processing difficulties are much the same as with ducks, but exacerbated due to the larger size of the geese.

Game Birds

Game birds include a wide range of species, many of which are at best only semi-domesticated. Commonly raised species of game birds include pheasants, quail, and guineas. Less-common species include Chukar and Hungarian Partridges.

Guineas are a special type of game bird because, besides providing meat and pest control, they are often used as watchful sentries on the farm, especially against raptors. A guinea's boisterous alarm calls can snap a livestock guardian dog and the farmer into action while sending a flock of chickens diving for cover. Large flocks of guineas have also been known to encircle and attack single coyotes and foxes. Depending on their use and the setting on the farm, guineas can be a watchful asset or a noisy nuisance and a source of contention with the neighbors.

Game birds are typically raised for one of three purposes: hunting stock, meat production, or ornamental/hobbyist use. A resourceful farmer may be able to raise game birds for release on a hunting ranch or game preserve to keep up levels of stock harvested by hunters.

Game birds are considered a nonamendable species by the USDA. That means that they are not governed by many of the federal laws concerning processing, unlike other poultry such as chickens and turkeys. In many areas, on-farm processing will be a legitimate option, and even the regulations of the Federal On Farm Poultry Processing Exemption will not likely apply. As long as there is no transportation across state lines and commonsense health and sanitation considerations are met during processing and handling, federal regulations should not be a problem. State and local health laws will still apply, though, and should be considered thoroughly before proceeding.

Because of their wild instincts, some game bird species can be quite nervous and flighty, especially compared to more domesticated fowl such as chickens, ducks, and turkeys. This flightiness may make sportsmen happy, but it makes raising the birds on pasture exceedingly difficult; traditionally, game birds are raised in pens. The pens must have overhead netting and are typically kept quite dark for at least a portion of the birds' lifespan to reduce cannibalism in the flock. Old existing buildings on the farm, such as horse stalls or sheds, can often be converted to raise game birds.

Nutrition

Poultry have nutritional requirements that vary by species. An essential cornerstone of any profitable poultry operation is an appropriately

Vegetarian Chickens?

For reasons of cost and consumer demand, nutritional science has engineered a synthetic amino acid called methionine. This white, synthetically engineered powder enables poultry producers to keep their flocks healthy and productive on a vegetarian diet. Unlike pigs, poultry such as chickens and turkeys cannot get all their nutritional needs naturally from a plant-based diet due to their higher methionine requirements. If synthetic methionine isn't used, natural animal sources such as fish or meat-scrap meal are used. The National Organic Program regulations currently contain an exemption allowing the use of synthetic methionine powder in organic vegetarian poultry diets.

balanced feed ration. Generally, poultry rations can be broken into three main components — calories (grains), protein (animal or a synthetic powder), and vitamins/minerals. Many small-scale producers use GMO-free or organic rations for their poultry, adjusting their meat and egg prices accordingly.

As mentioned above, the nutritional requirements of poultry vary according to the species produced and—in the case of chickens—whether the birds are being raised for meat or egg production. Chickens need a starter ration with a crude protein around 21%, while turkey poults and other game birds need around 28% protein in their feed. If given a ration deficient in protein, young birds will be unthrifty and increased mortality rates will occur. Among chickens, laying hens need less protein—but more supplemental calcium—than breeds chosen solely for meat production. Before selecting a particular breed of poultry to raise, the farmer should become familiar with the nutrient requirements of that breed.

No matter what type of bird is being raised, an old poultry farmer saying—“You can't starve a flock into profit”—holds true not just in terms of quantity of feed, but also in terms of quality.

For an in-depth coverage of poultry nutrition, consult the ATTRA publication *Pastured Poultry Nutrition*.

Pasture

Poultry did not evolve indoors, and access to the outdoors, especially on pasture, allows the birds to express their instincts and natural behaviors. Many producers are shocked to see just how much green forage the birds —especially chickens and turkeys —will eat when given the opportunity.

Poultry that graze on pasture produce healthier meat and eggs. Yolks of pastured eggs often take on an orange color, while fat deposited in the meat of pastured poultry often is yellow, evidence of the elevated vitamin and mineral content of the meat. The increased opportunity for movement and exercise on range, coupled with the difference in diet, gives pastured poultry a different texture (often described as denser or meatier) than industrial poultry. The more flavorful taste, meaty texture, high nutrition, and

better life of poultry raised on pasture enable the grower to charge a premium price.

Not all pasture is created equal. Palatability of forages on a pasture depends on the type of plant, the stage of growth, the growing season, and the plant's environment. Certain plants such as clovers, chickweed, and crabgrass are preferred by poultry and readily consumed at nearly any stage of growth. Many grasses, grains, and broadleaves, such as fescue, Bermudagrass, ryegrass, wheat, oats, and common weeds like ragweed and chicory are eaten while young, but ignored when mature. Once grasses and broadleaves go to seed, the leaves divert the plant's sugars and nutrition to the formation of seeds and stalks. Poultry will not eat rank forage. Plants stressed by drought or nutrient deficiencies are also less palatable and will be grazed less than healthy, nutrient-rich plants. Mowing or grazing the pasture to a short height, no more than three to six inches, is a great strategy to delay the plant's seed production, keeping it in the more palatable vegetative state.

With the growth in popularity of pastured and truly free-range poultry, a common misconception is that poultry can forage for all their needs. Without a doubt, poultry both need and crave vitamin-rich greens, as any farmer who's seen a flock of chickens or turkeys devour a patch of clover can attest. However, poultry are not ruminants and naturally get their protein and energy from both animal and plant sources.

Raising poultry on pasture differs considerably from raising other livestock on pasture. Given their small size, keeping the pasture height below half a foot is preferred for poultry. Not only does this keep the pasture grasses in a vegetative state, but it also makes it easier for the poultry to move around.

Housing

Housing ultimately depends upon the species being raised and the management system the farmer chooses. Any discussion of housing would do well to consider the reasons why the CAFO is the preferred housing and management system of the poultry industry today. Production moved indoors to control predation, prevent destruction of pasture, and reduce the influence of adverse weather, as well as to reduce the labor involved in raising poultry.

Meanwhile, striving for the lowest production price means the farmer who wants to be successful raising birds on pasture must design the system with predation, pasture health, efficiency, and pricing all in mind.

The first consideration in housing is brooding as the brooder is the place where fragile chicks are raised until they grow hardier. The absence of a protective hen means that the chicks must be provided a safe artificial shelter for growth with supplemental heat, shelter from the elements, food, water, and freedom from drafts. A brooder can be as simple as a box or kiddie pool lined with shavings and equipped with a heat lamp or as complex as whole buildings or sheds dedicated specifically to brooding. The scale and profit potential of the operation should determine the resources expended on the brooder.

A small producer can get around having a brooder by buying mature stock or by using broody hens to hatch chicks naturally. Producers planning on naturally brooding their chicks should be aware that this is an entirely new enterprise, and the time and expenses involved should be carefully weighed and evaluated.

Generally, poultry housing is either fixed, with the birds having access outside or not, or mobile. Mobile housing, such as a Salatin pen, hoop pen, or Eggmobile, is designed to be moved



Profitable broiler production on pasture means low-cost, easily portable shelter.
Photo: Leif Kindberg, NCAT

frequently. Semi-mobile housing is a compromise between the two styles, designed to be moved a few times a year. Chicken coops mounted on skids are one example.

In meat production, two types of pens are commonly used:

Salatin-style pens were named for Joel Salatin, an innovative and experienced pastured-poultry grower in Virginia. The Salatin pens are large, floorless moveable cages that the farmer moves with a small dolly at least once a day to give the meatbirds access to fresh grass and clean ground. Designs for the pens are readily available. Advantages of the pen system are the low housing costs, safety from aerial predators and most other predators, and control over where the manure is deposited. Disadvantages to the pen system typically involve improper pen design, overheating in the summertime, and difficulties on uneven ground.

Day-ranging methods involve a moveable pen in which the birds are secured at night, with access to pasture outside the pen during the day. Often, the pens are surrounded by electric poultry netting, as an additional layer of security, as well as to give better management over where the birds graze. An advantage to day ranging is that the pens can have floors, which can give meatbirds a place to stay dry in wet weather. The bedding on the floor, filled with manure, can be harvested, composted, and used to build soil fertility in vegetable production. Advantages of day ranging can include fewer daily moves, more options for coping with extended periods of wet weather and heat, increased freedom for the birds to move and forage, and more space per bird, generally resulting in less stress.

Fencing

There are places where a farmer wants poultry to be, and places where the birds are not wanted. If left on their own, poultry will invariably choose to visit the places where they are most unwanted—helping themselves to a few bites of EVERY ripe tomato on the vine ready for market, or depositing their manure on the farmhouse porch. Life can be very frustrating on the farm if poultry are not properly contained.

Fencing serves two purposes: keeping poultry in and keeping predators out. There are two types of fencing: physical barriers meant to contain

by the material strength of the fencing material, (such as field fence, chicken wire, or netting) and electric fence, which is a psychological barrier (through pain) to livestock and predators.

In terms of cost, electric fencing, whether electric perimeter fencing or portable electric poultry netting, is generally much less expensive, and easier to install than physical fencing. However, poultry are very well insulated with thick feathers over most of their bodies, which can make keeping the birds fenced in through shock problematic. A high joule rating on the electric charger is a must because in order to keep chickens in, the electric wire must be only inches from the ground. At such a low height, the fencing wire will often come into contact with growing grass, weeds, and brush. Therefore, powerful well-grounded chargers that are capable of operating even when grass or weeds grow up around the electric fence must be used; such chargers can also keep themselves clear of vegetation by the power of their electric pulsing. Besides the charger, the most important part of an electric fence is the grounding system, which is the cause of most electric-fencing problems.

Common Poultry-Production Problems

Predation

At some point, every producer has a run-in with predators. Due to their small size, poultry are readily killed by predators as small as weasels, mink, and raccoons and as large as bears and mountain lions. Flying predators from the diminutive Cooper's hawk (aka chicken hawk) to large eagles and owls also prey upon poultry. If predation is looked upon as a flaw in husbandry, the producer will adapt quickly to incorporate a holistic management solution to stop predation problems. A farmer cannot kill or trap his way out of predation: there are too many predators.

Often, multiple precautions are employed to avoid predation, ranging from livestock guardian dogs, physical and electric fencing, and watchful (and loud) guineas to secure shelter. Once the predators in an area perceive a farm's flocks as off limits, the local predators themselves become an effective layer of defense as their territoriality

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prevents new uneducated predators from moving in and preying upon the flocks.

Seasonal Fluctuations

Seasonality has a direct influence on poultry production and profit. The challenges are best explored by season:

Spring – As nature wakes up and comes to life, so do poultry. Spring is a wet time in most parts of the nation, and most problems during this season deal with abundant moisture and animal reproduction. Potential challenges include:

- Soil compaction and destruction of sward by poultry in wet, dormant pastures
- Disease outbreaks resulting from cool weather and damp conditions
- Potential overproduction of eggs during springtime lay
- Increased predation by predators that have young that they must feed – poultry become more attractive targets
- Late-season cold snaps that can chill out early batches of young poultry
- Flooding of low-lying areas
- Severe weather like hail, tornadoes or high winds that can threaten poultry, especially young birds
- Broody hens that take up nesting space and cause more broken eggs

Summer – Heat and humidity are the biggest threats to poultry during the hottest part of the year. Heat-related problems:

- Losses due to overheating (especially bulky meatbirds)
- Reduced growth of pasture vegetation due to heat and drought
- More frequent collection of eggs in higher temperatures to preserve egg quality
- Maintaining safe temperatures during on-farm processing
- Decreased electric fence effectiveness due to dry soils
- Difficulty moving portable fence posts in parched soils



Multi-species grazing under the protective watch of a Great Pyrenees guard dog.
Photo: Carla Spencer, Across the Creek Farm

- Hurricanes and tropical storms that threaten southern and eastern coasts

Fall – Fall is a transitional period. Late summer heat waves and drought or early wintry weather can cause unexpected difficulties growing out poultry, and it's a busy time for turkey growers. Potential concerns include:

- Reduced growth of pasture vegetation due to late heat and early freezes
- Bottlenecks in marketing and processing turkeys for Thanksgiving
- Fall rains and reduced growth leading to pasture compaction/destruction by poultry

Winter – Plummeting temperatures, biting winds, and minimal daylight are the challenges that must be overcome by the poultry farmer during this season of chilly dormancy. These factors manifest themselves as the following:

- Frozen waterlines and waterers
- Frozen combs, wattles, and eggs
- Snowed-in poultry leading to density-induced disease and pecking injuries
- Deep snow affecting farmer and poultry movement capability
- Reduced egg production due to decreased daylight, while still having to feed laying flock

- Wet poultry subject to chilling and death
- Heavy snowfall and ice storms that lead to collapsed housing

Processing and Handling

One of the biggest and most ubiquitous problems faced by small-scale and independent poultry growers is profitably raising poultry while staying in compliance with federal, state, and local regulations. The problem with compliance can be exacerbated in urban environments, where regulators have little, if any, familiarity with agriculture or livestock. The obstacles are often surmountable, but the producer must be able to calculate honestly whether the regulations and local environment make the poultry enterprise possible. Not all regulations make sense or are based on science, but any regulation can cost the producer time, money, and peace of mind if willfully ignored. While “flying under the radar” may work initially, what will the producer do when the farm grows in scale or gets positive media attention that accidentally exposes sketchy or illegal practices?

Below are some major areas of regulatory difficulties:

Zoning and flock size: Some local laws may prohibit poultry ownership outright; typically these are city or town ordinances. There are legal ways around this, such as petitioning the farm to be rezoned as agricultural, but usually this is an uphill battle and a huge potential headache.

If poultry aren’t prohibited in cities, there may still be *laws that restrict poultry ownership*, such as a limit on the number of hens. For instance, in one southern state, producers can have up to 200 hens if they sell ungraded eggs, but if they sell graded eggs, the number of hens allowed is unlimited.

Processing: The federal Poultry Products Inspection Act provides exemptions for on-farm processing of poultry. This is a boon to small farmers as there are very few poultry processors that work with small or independent poultry farmers in the United States. The regulations are not exceedingly complex, but they are complicated by a hodgepodge of state regulations that cannot be laxer than federal standards but can be and often are, much stricter than federal standards.

Roughly half of the states have additional regulations for on-farm processing, while the remaining states simply defer to the federal standards. Local laws and inspectors, which for most farmers will be on the county level, can further complicate the matter.

If producers are fortunate enough to be near a local poultry processor, they have a powerful tool at their disposal. The investment in a processing facility and equipment for processing can be deferred, if not avoided altogether. In addition, the huge labor requirements are not borne by the farmer, who typically has plenty of other work to do. Generally, there are three types of local processors:

USDA Inspection: USDA-inspected processors have a federal meat inspector present on their processing line. The poultry processed at USDA-inspected facilities can be sold anywhere and across state lines. Having a USDA inspection seal on the label makes selling to restaurants and retail outlets easier.

State Inspection: State inspection functions much like USDA inspection but is only recognized inside of the given state. The meat may not be sold outside the state (unless the processor is participating in a new program that will allow specially state-inspected meat to be sold in other states).

Custom Inspection: The poultry processed at these processors cannot be resold. That being said, poultry can be sold live to customers and then processed by a custom processor. Typically, a close examination of the law will reveal a way for the producer to drop the poultry off and the customer to pick the final product up at the processor or, in some cases, at the farm.

Poultry Processor Locator

Do you need a processor to dress out your live poultry? Check out NCAT Sustainable Agriculture Project’s (ATTRA) Small Poultry Processing Plants and Services Database at https://attra.ncat.org/attra-pub/poultry_processors/ for a state-by-state listing of processors who work with independent farmers.

The quality of slaughter is extremely important in being able to offer the customer a high-value product. A top-dollar product must provide top-dollar

Some local laws may prohibit poultry ownership outright; typically these are city or town ordinances.

appeal and quality. Typically, clear plastic shrink-wrap bags are used to package meatbirds, resulting in an attractive, high-quality product.

Birds are sold either fresh or frozen. While consumers greatly appreciate the convenience of unfrozen poultry, such birds typically store less than a week, and small-scale producers cannot afford losses due to spoilage. Frozen birds, properly packaged, maintain their quality for months, allowing the producer time to sell meatbirds. Fresh birds can be offered immediately after processing through retail stores or for special occasions when there's a common timeline for demand, such as for Thanksgiving turkeys. Otherwise, the farmer's best option is usually offering customers frozen birds.

The more of the bird that can be sold, the better. Besides just the meat on the carcass, other less demanded pieces can be marketed and sold, especially if the consumer is educated on their use. These parts can include the feet and necks for stock, as well as livers, gizzards, and hearts. In addition, less desirable parts such as the lungs and fat trimmings can be ground up with the heads and made into a raw dog food to sell. Farmers who slaughter their poultry on-farm through the exemption have the added benefit of being able to compost the harvested feathers and innards, making sure that all the money invested in producing these parts gets reinvested back into the farm through fertility.

Before processing, the farmer must make sure that there is adequate space for transporting and storing the final poultry product. Often, large ice chests are used to transport chilled poultry to freezers or coolers for final storage. To sell at farmers markets, many producers carry chest freezers on the back of their trucks or on a trailer. Chances of success with poultry are increased if the producer thinks through the whole process of producing poultry from brooder to plate.

Fitting Poultry Onto the Farm

A lot of money must exchange hands in order to make a small amount of profit selling poultry. Unlike ruminants, which can utilize solar energy harvested on the farm in the form of pasture and browse, poultry needs feed that usually is bought and trucked to the farm. The heavy input demands of poultry mean that any losses

are felt in the pocketbook because the producer not only loses the bird and the profit from sales but also all the feed that went into growing that bird. Just because poultry are typically small doesn't mean that there's not a large amount of money tied up in each bird. This makes it critical that problems like predation and disease be dealt with aggressively.

An advantage of poultry is the short turnaround time and quick return on investment. A flock of meatbirds generates income after only a few months; a laying flock in less than a year. The key to making money with poultry is to match the demands of the farm to the poultry species raised and to have one enterprise be profitable before adopting another.

Each species is unique in the timing, duration, and amount of cash flow brought in as well as the daily and seasonal time demands that the poultry place on the farm family. Careful consideration and planning go a long way in making a profit with poultry on the farm.

Rabbits

Rabbits are another small livestock that can be integrated into many farm operations. Rabbits can be raised for meat and also for pet or show-stock sales. The U.S. meat rabbit industry was more significant around the time of World War II but has since declined. The per capita U.S. rabbit meat consumption was .02 pounds in 2000 (U.S. Rabbit Industry Profile, 2002). Typical markets for commercially produced rabbit are grocery stores in metropolitan areas and high-end restaurants. There is some demand for the low-calorie, low-fat meat through direct sales.

In most commercial operations rabbits are raised in indoor cages. Rabbits can be raised on pasture, and many producers use a combination of indoor and outdoor production. Two medium-sized breeds, the New Zealand White (NZW) and the Californian, are the most important for meat production. The NZW is considered the best breed overall based on mothering ability and carcass characteristics. However, crossing male Californians with female NZWs and then breeding the females from this cross back to male Californians results in larger litter sizes and heavier fryers than using straight NZWs. Rabbit production literature often focuses on

Typical markets for commercially produced rabbit are grocery stores in metropolitan areas and high-end restaurants.

the NZW, but the information can be applied to other breeds as well. There are many other breeds of domestic rabbit raised for meat, show, and other uses. Rare breeds of rabbit are a priority of the American Livestock Breeds Conservancy, including those of American origin such as the American, Chinchilla, Silver Fox, and Giant Chinchilla.

Housing

Housing depends on the scale of the operation. It is economical to make use of any outbuildings already available on a property. In warm areas even a lean-to can provide an adequate roof to keep out the rain and sun, although dogs and predators could be a problem if not fenced out. In mild climates, housing can be open-walled (for example, a long narrow A-frame with a walkway down the middle and a row of cages on either side with roll-down plastic curtains or hinged boards for cold weather). In cold regions where there are prolonged periods below freezing, buildings need to be enclosed to prevent drafts and conserve body heat. Heating is usually not necessary since rabbits have thick fur coats. However, in cold weather drafts can be a problem, particularly for newborn kits in the nestbox. In fact, small-scale and pasture producers often do not breed rabbits in the wintertime. Unheated rabbitries also risk freezing of water supplies in cold weather. Unheated water bowls and water lines can freeze, and even if the lines are heated, the watering nipples can still freeze.

Surprisingly, hot weather is more of a concern than cold weather. With high humidity and temperatures about 90° F, adult rabbits overheat. Rabbits are ideally kept where the temperature can be maintained at 62° F. In any type of building, ventilation is very important in order to reduce ammonia buildup and to help the animals stay cool during hot periods. Open-walled buildings can be ventilated by natural air flow. An enclosed building will require fan-assisted ventilation, and in hot areas, cool cells or foggers can help cool the building. Single levels of cages are easier to ventilate and cool than stacked rows of cages.

Commercial rabbitries usually house animals in all-wire cages suspended above the ground. The cages are hung at a height convenient to the producer, usually at waist level. Manure pellets fall through the wire bottom to the ground instead of

remaining in the cage, preventing coccidiosis—a parasitic infection spread by contact with the manure. The manure accumulates on the ground until removed by wheelbarrow or tractor. This manure is a great asset to a vegetable garden.

Quonset-style cages that are rounded on top save on wire material. The placement of doors on Quonset cages allows for easy access to the rabbits (it is easier to reach into Quonset than square-style cages). However, it is important to ensure rabbits have sufficient space.

When building or designing rabbit housing, remember that rabbits tend to gnaw, especially on wood. If plastic water lines are used to deliver water, attach them to the outside of the cage so rabbits cannot chew them.

Feeding

Rabbits eat only plants and are nonruminant herbivores. They recycle feed by reingesting the cecotropes. Cecotropes are small particles of digested food that collect in the cecum (hindgut), which the rabbit voids once a day and consumes directly from the anus. Cecatropes are sometimes called “night feces” and look softer than the hard, round pellets normally seen.

Rabbits are usually fed a commercial pelleted diet that is balanced in the necessary nutrients (protein, energy, vitamins, and minerals). These diets contain alfalfa, grain (barley, wheat mill by-products), protein supplements (soybean meal), vitamins, and mineral supplements.

If your herd is small, it may be economical to reduce the amount of pellets and feed rabbits some available greens. Examples of greens and succulents are fresh legumes (alfalfa, clover), grasses, vegetables (lettuce, celery), roots and tubers (carrots, potatoes), weeds (dandelions) and comfrey. Clean table scraps that fit into these categories also are acceptable. If greens complement a pelleted diet, the amount of pellets can be reduced by 50% without lowering rabbit production. However, since fresh greens are about 80 to 90% water, it is difficult to raise rabbits solely on these materials because they are not nutrient-dense.

Instead of using a commercial pelleted diet, producers can mix their own feedstuffs, especially if they grow or purchase their own feed ingredients. Before commercial pellets were available,

When building or designing rabbit housing, remember that rabbits tend to gnaw, especially on wood.

people often raised rabbits on a diet of alfalfa hay and white oats. This is an acceptable diet if salt licks are also provided.

A legume hay such as alfalfa or clover provides high protein and fiber and can be included at a level of about 50 to 60% of the total diet. A concentrate for energy (grains such as oats or barley) is needed at a level of about 20 to 30%. The grain should be rolled or ground to facilitate digestion. Feeding too much grain can cause a carbohydrate overload in the hindgut, and the animal may die from diarrhea (enteritis). Grain by-products that are high in fiber, such as wheat bran or wheat mill run, are a good choice. Adding hay to increase fiber and decrease the amount of grain fed will also reduce enteritis. A small amount of protein concentrate such as soybean meal or sunflower meal at about 10% of the diet ensures adequate protein. Rabbits need diets with about 16 to 17% crude protein as well as mineral supplements or salt spoons.

The grain and hay ingredients mentioned above are relatively dry (only about 10% moisture). Rabbits do not relish eating a powder-dry mixture. If the mixture is moistened with feed-grade molasses, it will be more palatable to the animals. If the alfalfa or other forage is in hay form, it can be offered separately.

More feed wastage can occur with nonpelleted rations than with pelleted rations. The rabbits may feed selectively, and the cage bottom and ground below can become littered with hay. This should be kept in mind when considering the cost-effectiveness of feeding home-mixed rations compared to commercial pellets. It may be possible to have a feedmill custom mix and pellet a ration.

Having a balanced ration ensures that diets contain the correct amount of nutrients for rabbits during different stages of growth or reproduction. The book *Rabbit Feeding and Nutrition* has a section that deals with ration balancing and nutrient requirements.

Grazing Rabbits

Rabbits may be pastured in outdoor pens placed on the ground in order to harvest their own fresh forage. Fryers can be kept in outdoor pens with wooden slats or chicken wire on the floor to prevent the rabbits from digging out of the pen. Pens are moved daily to fresh pasture, and

the rabbits are provided with concentrate feed. Ideally, rabbits won't graze the same area of pasture again for at least six months to prevent the spread of coccidiosis.

There are many different production models for raising rabbits on pasture. Some producers choose for rabbits to be born and raised to weaning indoors. The weaned rabbits are then moved to portable cages on pasture.

Rabbits raised on pasture may take longer to reach slaughter weight. Rabbits that have been bred for commercial confinement production may not perform well on pasture. You may have to spend time experimenting with breeds and breeding to find the type of animal that best fits your production system. As with any livestock, you should purchase breeding stock that have been raised in a similar manner to your production system. So if you are raising rabbits on pasture, it is in your best interest to buy stock from another pasture producer instead of stock that has been raised indoors and fed only a commercial feed ration.

Reproduction

An important part of reproductive management is taking the female (doe) to the male's (buck) cage. Otherwise, the buck would spend his time marking new territory in the doe's cage instead of breeding. Breeding should occur within about one minute. If it does not occur, the doe should be removed and retried in a few days. The doe should not be left in with the buck for long periods of time because they may fight. Rabbits do not have a heat cycle like many animals do—rabbits ovulate after mating.

The doe's abdomen may be palpated 10 to 14 days after breeding to see if she is pregnant. The embryos are round and feel like grapes. Birth of the kits (kindling) occurs in 31 days with NZWs. A nestbox with wood shavings or other bedding material is placed in the doe's cage at 29 days so she can pull fur and build a nest. It is a good policy to breed several does on the same day in order to be able to divide large litters among the does at kindling. NZWs make good foster mothers. Being touched by human hands at birth does not harm the kits or cause the mother to reject them. Eight or nine kits with each NZW mother is an appropriate number.

As with any livestock, you should purchase breeding stock that have been raised in a similar manner to your production system.

Cannibalism by the mother is often due to poor nutrition, but sometimes it may have no apparent cause.

Rebreeding does about one and a half months after kindling allows four or five litters per year. Kits are generally weaned at 30 days of age; however, if the doe is rebred at one and a half months after kindling, the kits can be left with their mothers for up to two months. This is a particularly useful practice if cage space is limited. With top nutrition and management, some producers wait only one to seven days after kindling to rebreed the doe, for a maximum production of up to 11 litters per year. However, does may require a rest after three or four breedings at this accelerated rate. A good doe sends an average of 50 fryers a year to market. Young rabbits (fryers) should be separated by sex after 12 weeks to prevent fighting and inbreeding.

Older rabbits culled from the herd are less valuable due to tough meat and are marketed as stewers.

Management

It is important to keep production records in order to know when to carry out crucial activities such as putting in the nestbox, and to aid in choosing the best replacement stock. Ear tags or tattoos are necessary with large numbers of rabbits. Sanitation is very important. Cages should be cleaned of fur and dust accumulation. Nestboxes should be cleaned and disinfected after use.

Health

Coccidiosis is the most common disease in rabbits. It is caused by a protozoa. Symptoms may include loss of appetite, “pot belly,” diarrhea, and an inability to gain weight. Good sanitation is the best way to prevent coccidiosis. Keep cages, feed, and water sources free of fecal contamination.

A commonly encountered disease is mastitis, or inflammation of the mammary glands, which is treatable with antibiotics. The bacteria *Pasteurella* causes snuffles and pneumonia; chronic *Pasteurella* suffers should be culled from the herd. Rabbits showing overgrown teeth, those developing sore hocks, and poor producers also should be culled.

If antibiotics are used to treat disease, a withdrawal period is required before slaughter to ensure residues have cleared the animal’s system. Since antibiotics and hormones are not routinely

used in rabbit production, the meat is especially appropriate for natural and organic markets.

Processing

Rabbits that receive good nutrition reach a market weight of four to five pounds live weight within 10 to 12 weeks and are marketed as fryers. It may take longer to reach market weight with poorer nutrition. Older rabbits (usually about six pounds) culled from the herd are less valuable due to tough meat and are marketed as stewers. Dress-out percentage for fryers is 50 to 60%, with retail weights between two and three pounds.

Rabbit processing generally consists of stunning or killing the animal, hanging it to bleed, removing the head, removing the feet and tail, removing skins, eviscerating, washing the carcass, chilling the carcass in a water tank or refrigerated room, aging the carcass under refrigeration, and packaging.

The federal inspection of rabbit meat is voluntary. Under voluntary federal inspection, each rabbit and its organs are inspected to ensure it is wholesome and free from disease, and they are slaughtered under USDA poultry regulations. Since rabbit inspection is voluntary, the federal government does not pay for it, so the producer must cover the costs. According to the USDA FSIS, when rabbit is not voluntarily inspected, the processor is subject to the Food and Drug Administration (FDA). Some states only permit the sale of rabbit if it is inspected under state laws. Contact the department of agriculture for information on regulations in your state. Producers should also check with any states to which they plan to ship rabbit meat.

Marketing

Marketing rabbits can be difficult and frustrating because there are few processors that buy live rabbits, and both supply and demand can be unstable. In the wintertime, producers may have a more difficult time raising rabbits, and therefore supply is limited; however, in the summertime, supply can be glutted. A market report can be found at www.arba.net/Processors.htm. This list includes the names and addresses of processors along with information on current prices paid for fryers and stewers.

The U.S. does not have a significant history of rabbit consumption. However, there is

untapped potential, especially for the natural and organic markets. Direct marketing requires extra time and effort for the producer but provides the opportunity to produce a high-quality product, educate the consumer, and develop customer loyalty.

In establishing a direct market, producers can start with meat for family or selling to neighbors and friends. Education helps build a loyal customer base. Presentations to local organizations such as civic groups emphasizing that rabbit is a healthful meat, may attract customers interested in lowering fat and cholesterol in their diets. Customer bases include local health food stores or grocery stores interested in carrying farm-fresh products (these usually require a steady supply), farmers markets, and restaurants. Although there is a lack of USDA processing plants, the fact that rabbits do not have to be inspected is an opportunity in some states to sell meat even without access to a plant.

The rabbit industry has many challenges in the United States. Rabbit meat is high in cost compared to other livestock and should be considered a luxury meat. Feasibility studies and business planning are needed before investing money in rabbit production. Raising rabbits is a business a producer should grow into gradually as experience increases and management improves.

Besides the sale of meat, rabbits can also be raised and sold for pets and show animals. Thousands of youth across the country participate in 4-H rabbit projects and shows. Raising rabbits for these purposes is very different than raising them for slaughter. There are dozens of recognized breeds. If you are selling rabbits for show you must pay special attention to the various characteristics specific to a particular breed.

Products other than meat and breeding stock include manure fertilizer, rabbit pelts, and worm production from the manure.

In many ways, rabbits are more suited for small-scale production than large-scale industrial production. It is difficult to automate rabbit production because does must be housed individually due to territorial behavior. Their feed costs can be high because they require a high-fiber, low-energy diet that costs more to produce than typical corn and soybean diets fed to poultry and swine. For example, alfalfa is an excellent feed for rabbits, but it is expensive.

However, qualities that make rabbits less suitable for industrial production make them more suitable for small-scale production. They can eat forages, hay, garden waste, and high-fiber milling by-products like wheat bran, and they can be an important part of a diversified farm.

Hogs

Hogs are great animals for using waste vegetables and for rooting up gardens at the end of the season. If you keep dairy animals, hogs will enjoy consuming all the excess milk or whey. It is possible to raise hogs on home-grown feedstuffs. However, hogs are not ruminants, so they don't use forages as well as grazing animals do. They will eat some pasture and they enjoy the exercise of finding their food, but they will need supplemental feed as well to grow and be healthy. Therefore, one of the big considerations before raising hogs is to check on the availability and cost of feed. See www.ipic.iastate.edu/publications/130.FoodBudgets.pdf to gain a realistic idea of how much grain will be needed to raise pigs. Then check prices in your area and figure out how many dollars will be needed to feed the pigs.

Because hogs are rooting animals, it is important to protect the land where they are kept. A lot that is used only for hogs will become hard-packed dirt with a hollowed-out mudhole for wallowing. However, if hogs are rotated through several pastures, they can improve the land by fertilizing it. The difference is management. If there is not enough land to allow for frequent rotation, then

Terms:

Sow—female hog of breeding age that has had piglets

Gilt—female hog that has not yet given birth

Boar—male hog

Barrow—castrated male hog (used for meat, not for breeding)

Pig or piglet—young hog

Farrowing—giving birth

Weaning—removing the young piglets from the sow

Feeder pigs—piglets that have been weaned and are now eating grain and some forage rather than milk

Market hogs—hogs weighing more than 200 pounds (often much more)

Gestation—pregnancy. In hogs, gestation lasts 112-115 days, sometimes stated as "3 months, 3 weeks, and 3 days"



Hogs will readily consume waste vegetables. Photo: Linda Coffey, NCAT

a good option for keeping hogs is to have a concrete pad so the hogs do not destroy the soil texture and the forage cover on the land. The hogs can be rotated to the concrete whenever pastures are short or wet and allowed to graze again when pastures have rested and regrown.

To be comfortable, hogs in hot climates must have shade, and they will benefit from water misting or from water holes so they can keep cool. If they get too hot they can die from heatstroke. Also, be careful about abrupt changes of temperature. Cooling a hog with a water spray is a great idea unless they are already too hot; then a blast of cold water can shock and kill the animal.

On the other hand, small pigs will usually do well in warm weather but may pile up during cold weather in an attempt to get warm. This can lead to smothering if pigs pile on top of a weak pig. Therefore, if baby pigs are born in cold weather, it is helpful to have supplemental heat (a heat lamp or a warming blanket) provided as well as plenty of good bedding.

Hogs enjoy playing. It is entertaining to watch a few hogs rooting in bedding, carrying sticks, or enjoying wallowing in a water hole on a warm day. Raising your own hogs can allow you to provide pork for your family and your customers, knowing that the hogs had a comfortable life.

Breeding vs. Raising Feeder Pigs

Small-scale producers have two main options when raising hogs. They may choose to keep a few sows and a boar, raising litters of pigs and selling “feeder pigs” at weaning to others who want to feed out pigs for pork; to those who want to show pigs at a fair; or to people who will raise the pigs for breeding stock. The other option is to buy feeder pigs and raise them to market weight. This second option is much easier because you don’t have the animals year-round and you don’t have to deal with breeding. A boar can be expensive to keep, and can sometimes become dangerous, and artificial insemination service may not be available in your location. Also, farrowing sows (taking care of them at the stage when they give birth) can be tricky, and sows may become cranky at farrowing time. For beginners, raising feeder pigs offers a way to get to know hogs without as much commitment. If you like hogs, visit some farms that raise baby pigs and study the facilities and handling methods, and then find a mentor to help you learn the first couple of years. It’s also a good idea to read: see the **Resources** section for helpful books and newsletters.

Breed Consideration

Depending on your location and customers, there may be a lot of interest in alternative hog breeds. Today’s commercial hog is designed to be very lean, fast-growing and muscular. Sometimes those characteristics cause the pork to be dry; some customers find the meat from today’s hogs not as tasty as in the old days. So some producers are using old-style breeds to grow old-style pork. Also, conserving breed diversity may be very important for the future of our agriculture; niche producers can contribute to that by purchasing feeder pigs of rare and endangered breeds (see www.albc-usa.org). Be aware that if you are raising these breeds, they are not likely to be as efficient or as fast-growing. This means it will take more time and more feed (which means more cost) to raise those hogs.

It’s a good idea to assess the market situation before settling on a breed of pigs to raise. Can you sell the pork at a high enough price to more than cover the extra cost of purchasing and raising a rare breed? Crossbreeding is common and crossbred animals are often a better choice than purebreds if pork alone is the goal. Whichever

breed or cross you choose, it is best to buy pigs off a farm and notice the overall health of the herd and the type of management used. Buying from a sale barn can be convenient and may be cheaper, but the stress of being hauled to the sale, mixed with many other animals, sold, and then hauled home often means that pigs will get sick. It reduces stress to buy the pigs from a nearby farm. This may limit your choice of breed to what is available in your vicinity. Some tips on selecting pigs are found at http://florida4h.org/projects/animal_sciences/SW_pdfs/4HSWG04.pdf. This advice is geared to youth choosing show pigs; adapt it to your goals.

Nutrition

Nutrition is fundamental to health. Understanding the needs of pigs will help the pigs to grow well and be healthy, and contribute to the success of the enterprise. A brief discussion of nutrition for pigs appears at www.ipic.iastate.edu/publications/310.Nutrients.pdf. See the Table of Contents for the Niche Pork Production Handbook at www.ipic.iastate.edu/publications.html. This Handbook will guide you in technical knowledge for many aspects of hog production, and is highly recommended.

As stated previously, feed cost is a major issue for hog enterprises. See www.ipic.iastate.edu/publications/830.ReduceDietCost.pdf for examples of how feed costs may be lowered. Also, pay attention to the feeders: if there is feed on the ground, that is throwing away money. Sometimes waste can be avoided by feeding twice a day, just the amount the hogs can clean up in 20 minutes or so. If that is not feasible, a self-feeder that lets the hogs eat anytime, and has a compartment that stores more feed, is a convenient option.

It is vital to provide clean, fresh water to the pigs. This sounds easier than it is on a small holding—hogs will flip over a small water tank, and will lay in a large one. For a few hogs, we found (through lots of trial and error) that a barrel fitted with a cup valve and placed outside the hogpen on a small concrete pad worked well. The concrete pad keeps the barrel stable, and positioning the barrel outside the pen with only the watering cup where the hogs can reach it has prevented any mischief from the pigs. The water is clean, and it can be hooked up to a float valve so that the water level stays high. In the

summer, it is good to have shade over the barrel, as direct sunlight can almost boil the water in a hot climate, and that lowers consumption, leading to a dangerous situation for the hogs. Check the water temperature frequently and add cold water as needed. Conversely, in cold weather, you will need to warm the water or the barrel won't work. There are many options that will work for providing water to the pigs; think about how to keep it clean and available. Visiting other farms will show you examples.

Pasturing Basics

Hogs are not ruminants, and they don't use forages efficiently. However, a sow can use forages to supplement her diet, and the extra vitamins and protein will improve her health. The fiber will also be good for the sow. She will still need grain supplement but may eat less if the pasture provided is very good. Larger pigs can also use forages to some extent.

However, the farmer must think first of all about the land. Rotating pastures so that hogs don't destroy the forage base or the soil is critical and will also help keep the hogs healthier. Hogs can go in and clean up a garden or a grain field at the end of the season, and they can be used to help prepare a field for a new rotation. The manure they spread as they forage is a great asset. Just realize that the grazing and foraging



Pasture is a good feed supplement for hogs. Photo: Linda Coffey, NCAT

Related ATTRA publications

www.attra.ncat.org

Hoop Shelters for Hogs

Pork: Marketing Alternatives

Raising Organic Pigs



Hogs require a sturdy pen or fencing. Photo: Terrell Spencer, NCAT

cannot be the only source of nutrition for hogs and leaving the hogs in one place too long will be detrimental to the land. See <http://extension.missouri.edu/publications/DisplayPub.aspx?P=G2360> for more about appropriate pastures for hogs and their use.

Common Problems

Consider the following with hogs:

- Feed costs
- Fencing
- Marketing/processing

Feed costs will be the main expense of the enterprise. As discussed above, proper and cost-effective nutrition is a critical factor in raising hogs successfully.

For hogs to fit well on a small farm, there must be a sturdy pen or pasture fencing that will hold the animals. Hogs are not known for jumping, but they are clever and strong and like to root. They may root under a fence and get out, or they may push through a small hole. If they are trained to it, electric fence will work well. For perimeter fences, it is a good idea to use woven wire or hog panels with a hot wire offset to the inside, down low. This will discourage hogs from burrowing under the fence or from rubbing against the fence and pushing it over. Any equipment used for hogs will need to be durable: feed pans or feeders, water tanks or troughs, and fences, gates, and shelters must all

be strong. Shelters do not need to be fancy, but you will need to provide bedding inside during cold weather, and it is a good idea to make the shelter portable so that you can move it and rest the ground.

Equipment/Housing

Shelters should be strong, not fancy, and open to the side away from prevailing winds. Hogs push and lean and root and will quickly destroy flimsy structures. A simple three-sided shed built with wood framing and sheathed in metal will accommodate a few hogs. Allow six square feet for each pig under the roof and double that for a sow. If the sides of the building can be raised in summer to let in breezes, the pigs will be more comfortable. If that is not possible, rigging a canopy shade for the pigs will be an inexpensive way to protect them from the sun.

Once the shelter and a sturdy pen are provided, and a good feeder and waterer are in place, the hog enterprise requires very little labor. Spending time daily with the pigs will make them gentle and easy to handle and will help you observe their health and appetite. Hogs are smart and can be frustrating to move; use greed to your advantage when possible, and coax them to follow you. When you need to haul the pigs (to a veterinarian or to a processor, for example) it will be easier if they can simply walk into a trailer. If you are loading onto a truck, you will need a ramp of some sort. Some use a home-built portable ramp with slats nailed cross-wise to provide good footing for the hogs. The ramp has removable solid sides so the hogs can't jump off, and we place a feed pan placed in the truck is an extra incentive.

Marketing/Economics

A hog enterprise can sell live animals for breeding, meat, or show or cuts of meat to restaurants, stores, or individuals (if there is a USDA-inspected processor). The processing is vital to making a profit with this enterprise. Another key to making money is keeping feed costs low relative to sale price. Be sure to do the math before purchasing pigs or installing a pig pen. What will the feed cost? Can you sell the meat for a high enough price to more than cover all the costs, including feed, facilities, and processing? Use the feed budgets referenced earlier to help determine feasibility.

Connecting with other farmers will help in learning hands-on techniques; seeing innovative ideas for fencing, shelters, waterers, and management; and learning the production, management, and marketing of hogs. Also see the **Resources** section at the end of this publication. Budgets for hog enterprises are included in the **Appendix**.

Sheep and Goats

If your small farm includes some pasture area, sheep or goats may be a great addition to your enterprises. Versatile, easy to handle, attractive and appealing to the public, sheep or goats can produce meat, milk, fiber, and fertilizer while providing farm visitors (and your family) with entertainment and enjoyment.

This section will give an overview of sheep and goat enterprises and refer to many resources for further education. In-depth production information is included in ATTRA publications and in books listed in the **Resources** section. Hands-on experience and more learning is available on sheep and goat farms in your area, and gaining that knowledge before purchasing animals is advisable.

Here are some of the primary advantages of small ruminants (sheep and goats):

- Small size
- Quick return on investment
- Low cost for initial animals
- Easy expansion of herd or flock
- Many possible products

Because of their small size, sheep and goats are child- and elder-friendly, comparatively easy to handle and not as threatening as cattle. There is no need for expensive handling equipment; a small, secure pen to contain them while carrying out management tasks is essential, but it isn't necessary to have a headgate or squeeze chute or other expensive equipment. Sheep and goats fit easily on a small pickup truck or even in an extra-large pet carrier, and when they are converted to meat, a whole sheep or goat is affordable for customers and will readily fit into a freezer. They can even be slaughtered at home, if regulations allow.

Sheep and goats are prolific, usually having twins, and they mature early and are able to

breed at six to 10 months. They have a short gestation period (5 months) and they grow fairly quickly to market weight (six to 10 months). So it is easy to expand a herd, and you have a marketable product within a year. They remain productive for about eight to 10 years if properly nourished and if they are given good care. Because they are small, they do not require much feed.

Demand for sheep and goat products is generally good. In recent years, ethnic populations in the United States have greatly increased. These new residents brought with them an appetite for lamb and goat meat. Lambs and goats can feasibly be slaughtered on-farm, and some customers prefer to do this themselves so they can follow religious practices and provide a known source of meat for their family. Meanwhile, further processed meat products, such as sausage or jerky, and individual cuts of meat are popular with another group of customers. Also, recent interest in artisan cheeses has increased the market for goat and sheep cheeses, many of which are produced in small on-farm creameries. What's more, wool, cashmere and mohair from some breeds of sheep and goat are all luxurious natural fibers with high value to the right customer.

In addition to the three main products (meat, milk, and fiber), sheep and goats have many other uses. They are valuable 4-H and FFA project animals. They are affordable to purchase and to feed, can be kept in fairly small areas, are easy to train and to work with, and help young people develop responsibility and confidence without much cost. Sheep and goats are known as land improvers because they eat weeds and brush that other grazing animals don't, including some noxious weeds. Some managers are making money by hiring out their flocks and herds to control vegetation. Organic farmers cannot use synthetic chemicals to control weeds and brush, so grazing and browsing animals can be an excellent alternative. Goat and sheep manure can be composted and the resulting fertilizer spread on the farm or sold. Goats can be trained as pack animals or harnessed to pull a cart, and goats make nice pets if they are worked with daily. Finally, sheep and goats are beautiful animals, and having them on a small farm is enjoyable for the owners and visitors. They draw attention and admiring pats from children and add to the charm of the farmstead.

Related ATTRA publications

www.attra.ncat.org

Illustrated Guide to Sheep and Goat Production

Goats: Sustainable Production Overview

Sheep: Sustainable Production

Meat Goats: Sustainable Production

Dairy Goats: Sustainable Production

Dairy Sheep

Multispecies Grazing

Ruminant Nutrition for Graziers

Managing Internal Parasites in Sheep and Goats

Tools for Managing Internal Parasites: Copper Wire Boluses

Tools for Managing Internal Parasites: *Sericea Lespedeza*

Tools for Managing Internal Parasites: Animal Selection

Sheep and goats also have their drawbacks. These include:

- Small size
 - Vulnerable to predation
 - Difficult to contain with fence, they can squeeze through fairly small openings, and goats can jump
 - Small size means small potential profit per animal
- Quick multiplying
 - Potential for overstocking and inbreeding in just a few years
 - Internal parasite problems
 - Forage base deterioration if overgrazing is allowed
- Specialized management needed
 - Selecting healthy animals
 - Understanding feed needs of small ruminants
 - Learning about hoof care
 - Recognizing signs of illness and responding appropriately
 - Marketing effectively

With these basic concepts about sheep and goats in mind, it is a good idea to look at sheep and goats separately. While they have a lot in common, there are important differences between the two species. Knowing these traits helps in choosing the right animals for your farm.



Sheep and goats can improve pastures by eating weeds, brush, and forages other livestock don't eat. Photo: Linda Coffey, NCAT

Goats

Goats are active, agile, and intelligent, and notorious escape artists. They thrive with variety in their diet and are especially good at using browse, the leafy parts of vines and shrubs, and trees. For this reason, goats have historically been used to manage vegetation, including blackberries, poison ivy, kudzu, and leafy spurge. Goats are selective grazers/browsers and are able to choose the best diets possible when given free range. This selectivity means they can do better on “rough” ground than some other species; yet goats have a high need for nutrition and will not do well in situations where only poor-quality forage is available. Therefore, producers of goats can use goats to clean up an area but must be prepared to provide supplemental feed when naturally available feed is in short supply or is poor quality. You can gauge the need for more feed by watching the animals graze and observing the fullness of their “barrel” at the end of the day. A healthy goat that has been provided enough quality forage will be rounded through the belly.

Goats are hard on young trees, often stripping bark and snapping off small branches as they rise up on hind legs and pull branches down so that leaves are within reach. Goats can be in a pasture with mature trees as long as they don't strip the bark (as they will on fruit trees and cedars, among others). If your pasture contains trees that you value, plan to protect them in some way (chicken wire wrapped around the trunk, wire rings set around the tree, or electric fence), and be vigilant to make sure the trees aren't being damaged. In contrast to sheep, goats do not tend to graze grasses short; they work through a pasture clipping off the top of the plant and usually will not graze down low.

Goats are sociable, and goats that are worked with frequently (such as dairy goats that are milked twice a day) will develop bonds with humans and will be personable and useful pets as well as production animals. Goats (and sheep) do better with companions because they are herd animals.

Goat Breeds

All goats will produce meat and fertilizer. Some goats are raised only for meat; popular breeds

include Boer, Kiko, Spanish, Myotonic, and Savanna. Pygmy goats are miniature goats that are raised for meat or as pets.

Some goats are raised primarily for milk. Breeds include Saanen, Alpine, Nubian, LaMancha, Oberhasli, and Toggenburg. Nigerian Dwarf are miniature dairy goats, and there are some crosses (Kinders, for example) available as well. Many farms benefit from having two or more dairy goats to provide milk for the family, for orphaned baby animals, and for sale where regulations allow.

Other goats are raised for fiber and will need to be sheared or combed to harvest the fiber. Angora should be sheared twice a year, while cashmere can be harvested by combing. Many



Boer goats are a popular meat goat breed.
Photo: Linda Coffey, NCAT



Because of their small size, goats and sheep are child-friendly animals. Photo: Linda Coffey, NCAT

goats will produce cashmere, but some have been bred specifically to increase the yield and quality of cashmere.

Sheep

Sheep are selective grazers, like goats, but they tend to prefer grasses and forbs (such as weeds) rather than browse. While goats do not normally overgraze grasses, sheep will sometimes eat grasses too short. Sheep prefer young, tender regrowth over more mature forage and—if they are allowed to—they will ignore the mature grasses. Managers have to control sheep to prevent them from overgrazing an area because overgrazing is damaging to the pasture and is not healthy for the animal. Grouping the animals in a smaller pasture area will encourage even use of a pasture.

Sheep are herd animals and need companions. But even sheep that are handled frequently usually remain aloof from humans; although bottle-raised lambs are sociable when young, as they age they grow less friendly to humans. This can be an advantage since sheep grazing peacefully in a pasture are more manageable than animals that rush to mob the farmer (as tame goats may). However, it is disappointing if someone expects to be able to pet the sheep because the sheep may not be trusting enough to allow that contact.

At feeding time, both sheep and goats will rush in and can knock someone over. It's nice to have a feeding area that can be closed off, allowing the person doing chores to put out the feed without interference and then open the gate to let the animals in. While sheep are feeding the manager can assess their body condition and get them more used to being touched. It is especially important with sheep to feel the body condition (amount of fat over the bones of the spine and ribs) because wool makes it difficult to see; pressing firmly through the wool and quickly gaining an impression of the fat cover is an important management skill in assessing the feeding program. Either very thin or very fat animals are at risk for illness.

Sheep Breeds

Breed selection is based on the intended market(s), local climate, and personal preference. Breeds can be divided into eight categories (see Table 3.)

What breed(s) you choose to work with will depend on your needs and interests. Common breeds are Suffolk, Hampshire, Rambouillet, and Dorset. Hair sheep breeds include Katahdin, St. Croix, Dorper, and Barbados Blackbelly. All breeds have advantages and disadvantages. Crossbreeding is very common and allows for lambs to have desirable characteristics of more than one breed. Your farm goals should dictate what breed(s) of sheep you choose and whether or not you crossbreed. It is also important to remember that there is just as much variation among animals of the same breed as there is among animals of different breeds.

For more information on the various breeds, contact the American Sheep Industry Association. Also see www.sheep101.info/breeds.html for photos and descriptions of many breeds. The book *Storey's Illustrated Breed Guide to Sheep, Goats, Cattle, and Pigs*, by Carol Ekarius, is another good source of breed information. The American Livestock Breeds Conservancy (www.albc-usa.org) has information on rare and heritage breeds. For more information and research on hair sheep breeds, see the proceedings of the Hair Sheep Workshop (www.sheepandgoat.com/HairSheepWorkshop/index.html).

Special Concerns

Dairy

Sheep can be milked, but unless they are dairy breeds (such as East Friesian), they are likely to be difficult to milk and not very productive. Compared to dairy goats, dairy sheep will give less milk and for a shorter period of time (about five months of lactation, in contrast to 10 months for dairy goats). The milk is much higher in fat and solids, yielding more cheese per pound of milk than either goat or cow milk. The cheese made from sheep milk is delicious and is a valuable product. However, a sheep dairy will either need to be located near a processor (Wisconsin or Michigan are good locations) or do the processing themselves (making cheese, soap, or lotion). To investigate the sheep dairy business, see this article by David Thomas www.ansci.wisc.edu/extension-new%20copy/sheep/publications_and_proceedings/pdf/dairy/management/dairy%20sheep%20basics%20for%20beginners.pdf (note the budget provided at the end of the article), and a brief introduction at www.sheep101.info/dairy.html. ATTRA's *Dairy Sheep* publication goes into more detail and points to further resources; see www.attra.ncat.org/attra-pub/dairysheep.html.

Table 3: Sheep Breed Types

Breed Category	Description	Example
General purpose	Good balance between sire and dam traits	Dorset, North County Cheviot, Montadale
Maternal	Good adaptability to more difficult environments; above-average fleece; primarily found in range areas	Merino, Rambouillet, Targhee, Columbia, Polypay
Prolific maternal	Very large numbers of lambs (average three or more per ewe); excellent newborn vigor	Finnsheep, Romanov
Sire	Large mature size; rapid growth; superior muscling; lower carcass fat	Suffolk, Hampshire, Oxford, Shropshire, Texel, Southdown
Dairy	Specialized for milk production	East Friesian, Lacaune
Hair (meat)	Don't have wool; adapted to hot, humid climates; parasite tolerant	Katahdin, Dorper, St. Croix, Barbados Blackbelly
Specialized or long wool	Produce colored fleeces or fleeces with other unique characteristics; desired by fiber artists	Shetland, Icelandic, Lincoln, Border Leicester, Romney
Hobby or rare	Not typically used for commercial production; may be raised for exhibition, breeding stock, or to preserve the breed; may possess traits of importance to production in the future	Jacob, Cotswold, Navajo-Churro, Gulf Coast Native

Table adapted from "Changes in the Sheep Industry in the United States." 2008. National Research Council. Chapter 2.

Dairy goats have many uses on a small farm, providing the family with milk for drinking, cooking, making cheese and yogurt, and perhaps making soap. The kids produced each year can be sold for breeding stock or meat, and a good dairy goat will provide milk for 10 months of the year. Excess milk can be fed to other animals (calves, pigs, chickens) or (if regulations allow) sold to other individuals. Goat milk is especially useful for orphaned animals, including foals and puppies, so contacting local veterinarians may be a good way to start a network of customers for the milk. A good dairy goat will often produce a gallon (or more) of milk a day. See *Dairy Goats for Family Milk Supply* for more about the keeping of goats for home use. <http://osuext.intermountaintech.org/download/dairy%20goats%20for%20family%20milk%20supply.pdf>

As a money-making venture, dairy goats or sheep for cheesemaking may have great potential for a small-acreage farmer. But keep in mind that to be successful, this enterprise requires the farmer to effectively manage the animals, the cheesemaking, and the marketing. Each of those roles can be very demanding. This venture is labor intensive and requires a great deal of skill. An excellent resource for learning about the small-scale cheese business is *The Farmstead Creamery Advisor: The Complete Guide to Building and Running a Small, Farm-Based Cheese Business*, by Gianacis Caldwell. Before starting a commercial business, it is wise to get experience in managing dairy animals and in making cheese for your own use. Be sure your family is willing to milk twice a day and that they enjoy the cheese you make. For dairy enterprises, it is especially important to have available substitute labor to prevent family burnout.

For any type of commercial dairy operation, local health regulations are very important and should be investigated early in the planning process. See www.adga.org to find a list of the entities that regulate milk production and sale in your state and contact them for information (click on “about dairy goats” and then “starting a grade A or B dairy”).

Wool

Any woolled sheep, whether raised for meat alone or for both meat and fiber, will have to



Sheep are herd animals and need companions. Photo: Linda Coffey, NCAT

be shorn. In some areas, this is relatively easy to arrange. Talk to other local sheep producers and plan to cooperate to bring a shearer to your area. See “Be Nice to Your Sheep Shearer,” by Mike Neary, for tips on working with a shearer. (<http://ag.ansc.purdue.edu/sheep/articles/shear-art.html>). The American Sheep Industry has a shearer directory at www.sheepusa.org/Shearer_Directory. If you take good care of the sheep and of the wool clip you will increase its value. For some breeds, and when marketed as a commodity, the wool clip will barely bring in enough to pay for shearing; however, woolled sheep tend to be more muscular and faster growing than hair sheep and may be more acceptable in some markets. This can more than compensate for the hassle of arranging for shearing. Also, some sheep have higher-quality fleeces and will bring a better price. If the manager is willing to go to more effort and market fleeces to handspinners, the fleece can become an important source of income. More information about wool can be found at www.sheepusa.org/Wool_Information. Practical tips on marketing a better fleece and more information about the market are at www.sheep101.info/201/woolmarketing.html.

Goat fiber may also be direct-marketed or sold as a commodity. Mohair (from angora goats) and cashmere are luxury fibers and are prized by many. See www.angoragoat.com/mohair.html

for more information about raising angora goats and marketing their fiber.

For small-scale producers, wool or goat fiber offers an opportunity to add value through further processing and direct marketing. This cottage industry has many possibilities, from selling raw fleece, carded fleece, roving, and yarn (natural or dyed) to creating finished knitted, crocheted, woven, or felted items. Tanned sheepskins and craft items are other angles. The proprietor could offer classes, sell supplies as well as woolen items, and host “Shearing Day” events as another source of income. If the farm owner is not a spinner, it is possible to send fleece out to a mini-mill and have it processed and shipped back as yarn, socks, blankets, or scarves. These items may be very popular at farmers markets and can also be marketed to local stores, at craft fairs, or on the Internet. See www.etsy.com for an example of a marketing website. Local Harvest, state “Buy Fresh” and similar campaigns, as well as www.interweave.com can provide an idea of the size of the possible market.

Wool and other fiber items have a great advantage over many other farm products because they can last for many years if they are well cared for, unlike food items that are perishable and must be sold as soon as they are ready and refrigerated or frozen once harvested. Also, selling a craft item allows you to reach a customer who might not have considered purchasing other agricultural products directly from the farm. This may greatly expand your customer network.

Meat

Small ruminants (sheep and goats) are great meat animals, able to grow on forage alone and reach market weight in one grazing season. This makes them economical to raise. Your income from the lambs or goats depends on how you market them and how many pounds of animal you can raise on your farm; how heavy they are when you market; and how many there are at market time. This ties profit to your land capacity and your management (skill in managing means they will grow faster and live to maturity).

Land capacity (which can also be thought of as “stocking rate,” or how many animals you can graze in a season) depends on rainfall and soil, and the best way to get an estimate of likely capacity is to ask your local Extension agent or

NRCS agent. By looking at the soil types and forages you have on your farm and knowing the likely weather, a grazing advisor can recommend how many young lambs or kids your farm can support. For the health of both the land and the animals, it is better to be conservative with stocking rates.

While there is a lot of variation within and between breeds, sheep in general grow faster and more efficiently than goats, and they can be marketed at heavier weights. Depending on breed, goats may be marketed at 45 to 80 pounds, with 60 pounds being a common weight. Lambs may be marketed at 45 to 140 pounds, depending on the breed and on the customer. Lamb and goat prices are usually very similar, so the option to market more pounds of meat makes sheep a more profitable choice when grasses are the predominant forage. On the other hand, an abundance of brush on a farm may make goats the better option because they are equipped by nature to convert the brush into a salable product.

Another consideration regarding which species to raise for meat is the preference of local customers. Some ethnic groups have a strong preference for lamb, while others really want goat meat. Another factor in the decision of sheep versus goats is simply personal preference. Visit farms and spend time watching the animals to decide which you’d like to raise.

For either sheep or goats, you will want to pay attention to timing in marketing. Ethnic holidays



*Goats are able to grow meat on forage alone.
Photo: Margo Hale, NCAT*

provide times when demand (and therefore price) is higher. Learn more about ethnic holidays and about marketing small ruminants, at www.sheepgoatmarketing.info.

For more information to help you decide which sheep products (meat, milk, or wool) you are most interested in producing, see www.sheep101.info/201/meatwoolmilk.html. Explore the Sheep 101 and Sheep 201 courses (access from this link or www.sheep101.info) to get a good overview of sheep production. ATTRA's *Sustainable Sheep Production* publication presents more in-depth information and will be another helpful resource.

If meat goats are of interest, read ATTRA's *Meat Goats: Sustainable Production*. That publication gives a good overview and points to many other resources.

Nutrition

It is possible to raise both sheep and goats together. They are compatible, but there is a difference in their mineral requirements in that sheep are limited in the amount of copper they can use (25 parts per million in their daily diet; this is influenced by antagonistic minerals as well). If they exceed the limits they will suffer toxicity. Goats are widely believed to require more copper than sheep can tolerate. One way to accommodate both species is to feed a sheep mineral to the whole herd and supplement goats by

giving them copper boluses every six months to one year. Ask your veterinarian about this practice. Dairy goats that are individually fed also can have a cattle mineral or a goat mineral that contains copper in the recommended daily amounts sprinkled in their feeder at milking time. If facilities allow, the species could be separated at night and given free access to their own mineral feeders stocked with the appropriate mineral.

Sheep and goats both require ample quantities of forage. If forage is of sufficient quantity and quality, most sheep and goats will not need any supplementation except for salt and minerals. This is one of the primary advantages of raising sheep and goats.

A good description of the special needs of ruminant animals (which pertains to both sheep and goats) is found in the ATTRA publication *Goats: Sustainable Production Overview*. It is important to understand how to feed sheep and goats properly because if they are fed too much grain they can get very sick and die. If they are fed correctly, they will be less likely to succumb to illnesses, and they will be more productive and more content.

Finally, of course, be sure to provide plenty of clean, fresh water. Allow for one to three gallons per head per day. They need more in hot weather, when lactating, or when you are feeding hay.

The following tables give some general guidance on nutritional needs for goats.

Table 4: Dietary Protein and Energy Requirements of Goats*

Class of Goat	Ave. feed intake/day, lb ¹	% Crude Protein	% TDN
Growing doeling, 45 lb ^a	2.4	8.8	56
Growing male kid, 66 lb ^b	2.9	9.0	57
Yearling doe, 90 lb ^c	4.6	10.0	56
3-year-old doe, 110 lb ^d	5.0	11.7	69
Mature buck, 220 lb ^e	5.3	9.0	55
Dairy doe, 150 lb ^f	7.5	11.6	71

*Approximations based on dry matter in the feeds eaten

¹Calculated on basis of the dry matter in the feeds eaten

^aGrowing at the rate of .25 lb/day

^bGrowing at the rate of .33 lb/day

^cYearling female, last trimester of pregnancy and growing

^dMilking 2 quarts/day - enough for twins

^eNot gaining weight, moderate activity

^fNubian, milking 1 gallon/day of 4% butterfat

Source: Pinkerton and Pinkerton, 2000

Table 5: Practical Dietary Recommendations for Feeding Goats

	% protein	% TDN
Growing kids, dry does, and bucks	9-10	54-58
Pregnant goats	10-11	56-60
Lactating goats	12-13	62-68

Source: Pinkerton and Pinkerton, 2000

Challenges

Sheep and goats are vulnerable to predation because of their small size and lack of defenses. In some areas, the predators are coyotes, bobcats, wolves, or bears. Small farms with neighbors nearby may encounter some coyotes, but a more likely danger is domestic dogs. The danger may be from your own family pet; even nice dogs may enjoy chasing sheep and goats and in doing so can stress them to the point of death. Be sure your farm is fenced to keep out dogs and other predators.

In some areas a good fence will be enough, but for better security some flocks need a guardian animal. These are most commonly livestock guardian dogs of breeds such as Great Pyrenees, Anatolian Shepherds, Akbash, or Komondor. To be effective, these dogs must be bonded with the sheep or goats and must stay on the property. Donkeys, llamas, and cattle also have been used as guardians. Read more about protecting livestock in the ATTRA publication *Predator Control for Sustainable and Organic Livestock Production*.



Sheep and goats will need protection from predators. Photo: Linda Coffey, NCAT

Small acreages that are well fenced may not have many worries about predators. But internal parasites are another matter, and they affect grazing animals on small pastures more than animals that have extensive acreage to roam. Internal parasites cause the host animal to be sick: symptoms include weight loss, lethargy, swelling under the jaw, and sometimes diarrhea or anemia. If untreated, these symptoms can lead to death. Internal parasites are the number one health problem for sheep and goats. Learn more about internal parasites in the ATTRA publication *Managing Internal Parasites in Sheep and Goats*.

There are a few health management skills a sheep and goat owner should acquire:

- General observation (and knowing what normal behavior and appearance are for the species)
- Foot trimming to keep the hoof level, well-shaped and healthy
- Vaccinating—at the proper time and with the appropriate type of injection and site (usually intramuscular and in the neck)
- Feeding for proper nutrition
- Low-stress handling
- Castrating
- Disbudding (removing horn growth) for dairy goats
- Assisting with births, if needed

If you purchase healthy stock and provide good nutrition and a safe, low-stress environment, and take prompt action when you note signs of illness, you usually will not have problems with sheep and goats. Seek the advice and tutoring of your veterinarian and mentor, and educate yourself as much as you can. The ATTRA publications listed at the beginning of this section include much more information about care and management, as do the books and websites listed in the **Resources** section. For visual instruction about sheep and goat management, see ATTRA's *Illustrated Guide to Sheep and Goat Production*.

Equipment/housing

Sheep and goats are hardy animals and do not need fancy buildings. In fact, they do best with simple three-sided shelters that provide good

ventilation while protecting them from wind and rain. In dry climates, a windbreak or some trees may be all that is needed to protect sheep and goats from the weather.

If you are putting up a new shelter for goats or sheep, pay attention to prevailing winds and have the open side of the shelter facing away from them. For example, in some locations, winds and storms come from the southwest, and there shelters open to the east are best. Look around in your area and ask your mentor for recommendations about how to site your shelter.

If you are using an existing shed that is enclosed, consider opening up a wide doorway to allow better ventilation and easier access. Pregnant animals crowding through a narrow doorway can be injured, and sometimes dominant goats will block a doorway and prevent those lower in the social order from entering. Wider openings will help.

A barn or shelter where you can pen animals is helpful at kidding and lambing time. Many producers like to put ewes and their new lambs (and does and their new kids) in a small pen called a jug. You can make sure that lambs and kids are nursing successfully. This can be especially helpful for first-time moms.

If you are keeping a ram or buck on your property, at times you will need to separate it from the female animals. This may be done with a strong pen or good fencing or by keeping them in a shed or barn. Remember that males can become sexually viable at five months. So if you are keeping uncastrated young, you will have to separate them from their mothers and other females before this age to avoid unwanted breedings.

Before building a shelter for your sheep or goats, check local regulations. You may need permits to put up shelters, and it saves money and time to learn that up front. To learn more about fencing, shelters, and necessary equipment, see www.luresext.edu/goats/training/facilities.html#barn.

Dairy goat enterprises will need some additional equipment. If you are keeping goats for a family milk supply, you need at least a milk stand, a stainless steel bucket, a brush to groom your goats before milking, and a method of cleaning and sanitizing the teats and udder. At the other end of the scale, investing in a milking machine and setting up a commercial dairy to be Grade



Shelters for sheep and goats can be very simple, but this barn features a small milking parlor. Photo: Linda Coffey, NCAT

A will be a big venture and one that requires careful and thorough planning. A brief introduction to the subject is found at www.luresext.edu/goats/library/field/porter2-98.pdf.

Much more help with launching a dairy operation can be accessed at <http://datcp.wi.gov/uploads/Business/pdf/GoatStartUpGuide.pdf>. This document is 109 pages and leads the reader through goal setting, assessing interest in the business, and writing the business plan. It is loaded with helpful information. Don't miss **Appendix A**, a checklist to follow as you start up a goat dairy. This publication is written for Wisconsin farmers but has a lot to offer anyone considering this business. There is practical information about shelter needs, feed requirements, purchasing healthy goats, and much more.

Conclusion

Sheep and goats are versatile animals and produce many highly valued products. But margins are generally low, and managers must be careful stewards of the animals and good marketers to make money. On a small farm, sheep and goats will be valuable if they mesh with other enterprises and provide for family food needs; they are not likely to provide enough income to support a family. Investigate the budgets in the **Appendix** and do some research to see if further processing and selling more of the products can help the bottom line (or not). For example, perhaps you could tan sheepskins and sell them as a

sideline of the meat business. If there is a market and you can sell them for more than your cost, you have improved the income side of the farm without adding animals. Also, remember that if sheep and goats are helping control weeds and brush, that benefit should be credited to them, as should the extra fertility they bring to the farm. Spending time looking at other farms can help you make a decision about whether sheep or goats will be a good fit for your farm.

Cattle

Cattle have long been a part of diversified family farms. As with other livestock, there are benefits to adding cattle to your small-scale operation, but there are also many challenges. One of the primary benefits of raising cattle on a small acreage is to provide beef and/or milk for your personal consumption. You may be able to raise more than you can consume and market those products. Like other livestock, cattle can eat crop residues and provide important fertility to your farm. On small acreages (five acres or less) you will not be able to raise many cattle because of their size and forage needs. You won't be able to make a living raising cattle on a small acreage, but they can provide some streams of revenue.

How many cattle you can raise depends on your feed supply. Even in temperate areas with excellent forage, you will probably only be able

Things to consider before adding cattle to your farm:

Do you have a way to haul a full-grown milk cow or steer ready for processing?

Do you have a processor to process your beef? Remember if you are going to sell meat you must meet regulations and use a state- or USDA-inspected processing facility.

Do you have a consistent source of hay for winter feeding? Do you have a place to store hay?

How will you handle a full-grown animal of this size?

Do you have facilities that will contain potentially uncooperative full-grown cattle for veterinary treatment or loading?

to raise a couple head of cattle on a small acreage. You can check with your local Cooperative Extension Service for recommendations on cattle stocking rates in your area. Ideally you will be able to graze your cattle a majority of the year, but you will have to plan how to feed them during the winter or times of drought. As discussed earlier in this publication, you must consider where you will purchase hay, how you will store it, and if you will need equipment to handle it. A rough guideline is that cattle will consume about 2% to 3% of their body weight each day. So if you have a 500-pound steer, he will need about 10 to 15 pounds of hay per day.

Cattle also consume a significant amount of water each day. While a young animal in mild weather drinks only about 10 gallons per day, a lactating dairy cow in hot conditions may require more than 40 gallons per day, so an adequate water source and a sufficient tank are necessary.

If you are milking dairy goats and have excess milk, raising bottle calves may be an option. Dairy farms often sell their young (a few days to weeks old) bull calves fairly inexpensively. You can raise these calves to weaning and sell them or grow them until they are ready for slaughter. It is important to buy healthy stock, especially if you are buying very young animals. Make sure that they have received colostrum and any needed vaccinations. It is also a good idea to see if the calves can be castrated and dehorned before you buy them.



Raising bottle calves may be an option for your farm. Photo: Margo Hale, NCAT

You can also purchase weaned calves and grow them until slaughter. This is a great way to provide a beef supply for your family. Having ample forage to graze makes this option more economically feasible. If you are able to raise more than one steer, you can sell the meat. Remember that how you are legally allowed to sell your meat depends on your available processing. Refer to the earlier section on types of processors.

There are many breeds and types of cattle, and your local availability might determine what you choose to raise. Raising dairy steers is often a good economical choice. Refer to the ATTRA publication *Dairy Beef*.

A cow for milk is another great addition to a small farm. If you have excess milk, you can use it to make cheese or other dairy products, feed it to other livestock (hogs, calves), or possibly sell it. Each state differs in its requirements for selling milk and dairy products. In some states it is legal to sell raw milk off of the farm, and in others it is illegal. A few states have programs for microdairies, making it easier for very small operations to become licensed to sell milk and dairy products. Check with your state department of agriculture and health department to find out what is allowed in your state.

Milk cows require more labor than beef cows. Someone must milk every day. Another thing to consider is how you will get your cow bred each year. You won't likely be keeping a bull on your farm. You will need to find someone who will let you put your cow with their bull or find an artificial insemination technician. You might consider breeding your dairy cow to a beef bull and raising the resulting calf for slaughter.

Because cattle are large, proper handling of them is very important. You want your cattle to be calm and used to being handled. A milk cow should be halter broke so that you can easily gather her and lead her each day to milking. While it isn't essential that steers be trained to lead, they should be calm and easy to corral when needed. At the very least, you will need a pen where your cattle can be gathered. If they are not broke to lead, you will also need an alleyway or chute where you can do routine veterinary care or load them into a trailer for hauling. It can be



Having forage to graze makes raising a steer more economically feasible.

Photo: Margo Hale, NCAT

dangerous if cattle are too friendly, and this can be a problem with calves that were bottle fed and raised by a human. Behaviors that were cute when the calves were small (rubbing, butting) can be very dangerous when they weigh several hundred pounds.

On small acreages, cattle are not the most practical livestock choice. Though they can be a great addition to your farm and provide a supply of beef and/or milk for your family, they will not likely be a major source of revenue. Furthermore, with a small acreage that is only able to support a few cattle, the cost of handling facilities and equipment can't be spread among many animals to achieve an economy of scale.

Summary

A small farmer faces many difficulties, and we have tried to list those in this publication. Forewarned is forearmed. However, as farmers who raise livestock ourselves, we hope you also recognize the many benefits available from livestock, including income, land fertility, weed control, a healthy family food supply, learning opportunities for all family members, and enjoyment. Raising livestock (if done sustainably with respect for the carrying capacity of the land and for the dignity of the animals) is good for the farm, the neighborhood, the local food supply, and the local economy.

Related ATTRA publications

www.attra.ncat.org

Organic and Grass-fed Beef Cattle Production

Dairy Beef

Pasture, Rangeland, and Grazing Management

Ruminant Nutrition for Graziers

References

American Beekeeping Federation (ABF). 2011. Pollination Facts. American Beekeeping Federation. www.abf-net.org.

Caron, Dewey. 2000. Keeping Bees in Populated Areas – Tips for Suburban Beekeepers. Mid-Atlantic Apiculture Research and Extension Consortium (MAAREC), University Park, PA.

USDA –ARS CCD Steering Committee. 2010. Colony Collapse Disorder Progress Report. Washington, DC.

Ellis, Marion. 2011. Pesticides Applied to Crops and Honey Bee Toxicity. University of Nebraska Extension, Lincoln, NE. www.extension.org/pages/27967/pesticides-applied-to-crops-and-honey-bee-toxicity.

Demeter Association, Inc. 2006. Demeter United States Branch Home page. Demeter Association, Inc., Philomath, OR. <http://demeter-usa.org>.

Demeter International. 2011. Certification-Statistics. Demeter-International website. www.demeter.net.

Hoffman Black, Scott, Nathan Hodges, Mace Vaughn, and Matthew Shepherd. 2007. Pollinators in Natural Areas: A Primer on Habitat Management. Invertebrate Conservation Fact Sheet. The Xerces Society for Invertebrate Conservation, Portland, OR.

National Academy of Sciences (NAS). 2007. Status of Pollinators in North America. National Academy Press, Washington, DC.

National Organic Standards Board (NOSB). 2010. National Organic Standards Board Livestock Committee Organic Apiculture Recommendation. Washington, DC.

Sammataro, Diana and Alphonse Avitabile. The Beekeeper's Handbook. Cornell University Press, Ithaca, NY.

USDA National Agriculture Statistics Service (NASS). 2011. Honey. Washington, DC.

Resources

General

ATTRA Publications

Direct Marketing

Evaluating a Rural Enterprise

Finding Land to Farm: Six Ways to Secure Farmland

Multispecies Grazing

Paddock Design, Fencing, and Water Systems for Controlled Grazing

Pasture, Rangeland, and Grazing Management

Pastures: Sustainable Management

Ruminant Nutrition for Graziers

Start a Farm in the City

Other Publications

Aubrey, Sarah Beth. 2007. Starting and Running Your Own Small Farm Business. Storey Publishing.

For those who are not well-versed in business concepts, or for those who need information on applying concepts to farm businesses, this book covers business planning, financing, structure, regulations, insurance, pricing, marketing, and examining records to make good business decisions for the future. Many case studies, samples, farm profiles and plenty of advice.

Childs, Laura. 2010. The Joy of Keeping Farm Animals. Skyhorse Publishing. 238 p.

Covers several farm animals and is written by an author who knows the subject.

Damerow, Gail (ed.). 2011. The Backyard Homestead Guide to Raising Farm Animals. Storey Publishing. 353 p.

A large, beautifully done, informative and practical book that addresses special concerns and advantages of chickens, turkeys, ducks, rabbits, goats, sheep, pigs, cattle (beef and dairy), and bees. Basic management tasks, recordkeeping, facilities and fences, health, feeding, breeding, behavior, and much more are covered in this book.

Ekarius, Carol. 1999. Small-Scale Livestock Farming. Storey Publishing.

Aimed at new farmers, but useful for all, this book helps with planning enterprises, grazing systems, and marketing. Lots of help with budgeting, monitoring, and whole-farm planning—topics that are not addressed in many livestock books. Farmer profiles, good drawings, examples, and tables add to the usefulness of this book. Recommended.

Ford, Peter. 2000. The Home Farm Handbook. Barron's Educational Series. 127 p.

Information about chickens, ducks, geese, goats, and bees is presented with color photos and boxed points.

Hansen, Ann Larkin. 2010. The Organic Farming Manual: A Comprehensive Guide to Starting and Running a Certified Organic Farm. Storey Publishing.

This book is useful to all farmers in helping understand biological processes and in helping to see the whole system.

Heiney, Paul. 1998. Country Life: A Handbook for Realists and Dreamers. Dorling-Kindersley.

*Many colorful photos, helpful drawings, and charts.
Informative and practical to read.*

Levatino, Michael and Audrey. 2011. *The Joy of Hobby Farming: Grow Food, Raise Animals, and Enjoy a Sustainable Life.* Skyhorse Publishing.

This book describes the experiences of the authors and is filled with practical information. Geared to those who do not intend to make the farm their whole living, but there is a chapter on building the farm into a business, and many of the cautions apply well to all prospective farmers.

MISA. 2003. *Building a Sustainable Business: A Guide to Developing a Business Plan for Farms and Rural Businesses.* SARE Publications. www.sare.org/Learning-Center/Books/Building-a-Sustainable-Business

Business planning is an important part of owning and managing a farm. Business plans help farmers demonstrate that they have fully researched their proposed enterprises; they know how to produce their products and how to sell what they produce; and how to manage financial risks. This comprehensive workbook will guide farmers through every step of the process in creating a business plan. Includes many examples from existing farms.

Nash, George, and Jane Waterman. 2011. *Homesteading in the 21st Century: How One Family Created a More Sustainable, Self-Sufficient, and Satisfying Life.* The Taunton Press.

Thomas, Steven, and George P. Looby, DVM. 2007 *Backyard Livestock: Raising Good, Natural Food for Your Family.* 3rd edition. The Countryman Press. 139 p.

Another handy book for information and guidance. Poultry, rabbits, sheep, goats, pigs, veal, and beef cattle are covered, as well as general subjects regarding raising livestock.

Periodicals

Hobby Farms
P.O. Box 8237
Lexington, KY 40533
888-245-3699
www.hobbyfarms.com/publications.aspx
\$15 per year (6 issues)

Small Farm Today
3903 W. Ridge Trail Road
Clark, MO 65243-9525
800-633-2535
www.smallfarmtoday.com/
\$24 per year (6 issues)

American Pastured Poultry Producers Association (APPPA)
GRIT! Newsletter

P.O. Box 87
Boyd, WI 54726
www.apppa.org/renewal.htm

Countryside & Small Stock Journal
W11564 Hwy 64
Withee, WI 54489
800-551-5691
www.countrysidemag.com
\$18 per year (6 issues)

Mother Earth News
Ogden Publications
1503 SW 42nd St.
Topeka, KS 66609-1265
800-234-3368
www.motherearthnews.com
\$14.95 per year (6 issues)

Websites

Small Farm section from eXtension. www.extension.org/pages/8890/lpes-curriculum-small-farm-fact-sheets
This series from the Livestock and Poultry Environmental Learning Center (LPES) covers grazing, electric fencing, stewardship of soil and water, watering systems, and manure management.

Small Acreage Management, Colorado Extension Service.
www.ext.colostate.edu/sam/index.html
This site leads the reader through thinking about the resources on a small acreage and how best to protect and use them. Geared to those in low-rainfall areas but useful to all.

Small Acreage Management Self-Assessment. <http://clark.wsu.edu/horticulture/smallAcreageProgram/self-assess.pdf>
From Washington State University, Clark County Extension, this 16-page publication includes assessment questions and excellent photographs and descriptions to help landowners assess their current management and make practical improvements in response to identifying problem areas. Understanding these concepts will be very helpful regardless of location. Check with your local Extension service to see if there are materials available to help in your area as well.

Cooperative Extension Service. See www.csrees.usda.gov/Extension/ to locate the office nearest you.
The Extension service is a great source of research-based information and of local knowledge. Each county has programs and areas of interest and holds educational workshops. Contact your local agent for help in identifying and solving problems on your small farm, finding markets, and learning about local regulations.

Bees

ATTRA Publications

Beekeeping/Apiculture

Periodicals

American Bee Journal

51 S. 2nd Street
Hamilton, IL 62341
888-922-1293

www.americanbeejournal.com

*Monthly magazine for hobby and professional beekeepers.
\$26 (one year).*

Bee Culture

623 W. Liberty Street
Medina, OH 44256
800-289-7668

www.beeculture.com

*Information and resources for American beekeepers. \$19.95
(12 issues).*

Websites

Beesource Beekeeping

www.beesource.com

Information and online forum for beekeepers and beekeeping.

eXtension

www.extension.org/bee_health

*Information and resources on bee health from land-grant
universities.*

HONEYBEE.com

www.honeybee.com

Information and resources for the urban backyard farmer.

Natural Beekeeping Forum

www.biobees.com

*International forum focused on protecting the interests of bees
and promoting natural beekeeping.*

Organizations

American Association of Professional Apiculturists

Jeffrey Harris
225-767-9284

Jeffrey.Harris@ars.usda.gov

www.masterbeekeeper.org

*Association for research-based information on honey bee sci-
ence and management.*

American Beekeeping Federation (ABF)

3525 Piedmont Road, Building 5, Suite 300

Atlanta, GA 30305

404-760-2875

info@abfnet.org

www.abfnet.org

*Works with members, both beekeepers and those involved in
the industry, to ensure the future of honey bees.*

Eastern Apicultural Society

Everett Zurlinden, President

Beehavin' Apiary

P.O. Box 364

East Greenwich, RI 02818-0364

401-885-5172

president2011@easternapiculture.org

www.easternapiculture.org

*The largest noncommercial beekeeping organization in the
U.S. Promotes bee culture, education, and research. Website
contains information on annual conference and an extensive
listing of resources, including listings of USDA, state, and
university contacts and beekeeping associations.*

Mid-Atlantic Apiculture Research & Extension Consortium
(MAAREC)

<https://agdev.anr.udel.edu/maarec/>

*University-based working group providing research, informa-
tion, and educational resources for beginning and experienced
beekeepers.*

Partners for Sustainable Pollination

Kathy Kellison, Executive Director

1828 Beaver Street

Santa Rosa, CA 95404

707-321-4711

k.kellison@earthlink.net

www.pfsbees.org

*Works with farmers, growers, beekeepers, and scientists to
develop ways to improve the health of honey bees in pollina-
tion services and support native pollinators.*

Spikenard Farm Honeybee Sanctuary

445 Floyd Highway North

Floyd, VA 24091

540-745-2153

info@spikenardfarm.org

<http://spikenardfarm.org>

*Promotes sustainable and biodynamic beekeeping through edu-
cation, research and the development of a honey bee sanctuary.*

Western Apiculture Society

Dr. Eric Mussen, Extension Apiculturist,

University of California, Davis

530-752-0472

ecmussen@ucdavis.edu

<http://groups.ucanr.org/WAS/index.cfm>

Founded specifically to meet the educational needs of beekeepers in western North America.

Poultry

ATTRA Publications

Growing Your Range Poultry Business: An Entrepreneur's Toolbox

Label Rouge: Pastured-Based Poultry Production in France

Organic Poultry Production: Providing Adequate Methionine

Pastured Poultry Nutrition

Small Scale Poultry Processing

Small Scale Egg Handling

Other Publications

American Livestock Breed Conservancy. 2011. Turkey Manual – How to Raise Heritage Turkeys on Pasture. APPPA. 2006. Raising Poultry on Pasture – Ten Years of Success.

Christman, Carolyn J. and Robert O. Hawes. 1999. American Livestock Breeds Conservancy Birds of a Feather – Saving Rare Turkeys From Extinction.

Damerow, Gail. 2011. Storey's Guide to Raising Chickens.

Hayes, Leland and Melba. 1987. Raising Gamebirds – *A comprehensive species-by-species examination of both hobby and commercial rearing of gamebirds. Provides practical information for the beginning and experienced game bird breeder on how to raise ornamental quail, partridges and pheasants, with helps on commercial game bird breeding, with a section on health and diseases.*

Holderread, Dave. 1993. The Book of Geese – A Complete Guide to Raising the Home Flock.

Lee, Andy. 2004. Chicken Tractor – The Gardener's Guide to Happy Hens and Healthy Soil.

Lee, Andy and Patricia Foreman. 2002. Day Range Poultry – Every Chicken Owner's Guide to Grazing Gardens and Improving Pastures.

Plamondon, Robert. 2003. Success With Baby Chicks - A Complete Guide to Hatchery Selection, Mail-Order Chicks, Day-Old Chick Care, Brooding, Brooder Plans, Feeding and Housing.

Salatin, Joel. 1996. Pastured Poultry Profits.

Woods, Prince. 2008. Fresh-Air Poultry Houses – The Classic Guide to Open-Front Chicken Coops for Healthier Poultry. Norton Creek Press.

Periodicals

APPPA GRIT! – Published by the American Pastured Poultry Producers Association (APPPA). See contact information below.

Bi-monthly publication, free with APPPA membership.

Websites

American Livestock Breeds Conservancy Turkey Manual – How to Raise Heritage Turkeys on Pasture
www.albc-usa.org/EducationalResources/turkeys.html#manual

American Pastured Poultry Producers Association Listserve Contact APPPA, www.appa.org.

Small Poultry Processors and Services Database.
https://attra.ncat.org/attra-pub/poultry_processors

State Poultry Processing Regulations. Niche Meat Processor Assistance Network, 2011. www.extension.org/mediawiki/files/2/28/NMPAN_State_Poultry_Regs_Report_6June2011.pdf

Organizations

American Livestock Breeds Conservancy
P.O. Box 477
Pittsboro, NC 27312
919-542-5704
www.albc-usa.org

American Pastured Poultry Producers Association (APPPA)
P.O. Box 87
Boyd, WI 54726
grit@apppa.org
www.appa.org

Rabbits

Publications

Cheeke, P.R. 1987. Rabbit Feeding and Nutrition. Academic Press, Orlando, FL.

McNitt, James I. 2000. Rabbit Production. 8th ed. The Interstate Printers and Publishers, Inc., Danville, IL.
Available from:
Interstate Publishers, Inc.
P.O. Box 50
Danville, IL 61834-0050
800-843-4774
217-446-9706 fax

McNitt, James. 1996. Practical Rabbit Housing. Southern University and A&M College, Baton Rouge, LA.

Smith, Tom. No date. Commercial Rabbit Production. Mississippi State University. www.poultry.msstate.edu/extension/pdf/rabbit_production.pdf

Smith, Tom. No date. Starting a Rabbit Enterprise. Mississippi State University. www.poultry.msstate.edu/extension/pdf/rabbit_enterprise.pdf

USDA, 2003. Food Safety of Rabbit. www.fsis.usda.gov/OA/pubs/focusrabbit.htm

USDA. 2002. U.S. Rabbit Industry Profile. www.aphis.usda.gov/animal_health/emergingissues/downloads/RabbitReport1.pdf

Organizations

American Livestock Breeds Conservancy
P.O. Box 477
Pittsboro, NC 27312
919-542-5704
919-545-0022 fax
www.albc-usa.org

American Rabbit Breeders Association
1925 S. Main St.
Box 426
Bloomington, IL 61702
309-664-7500
309-664-0941 fax
www.arba.net

Hogs

ATTRA Publications

Hooped Shelters for Hogs

Pork: Marketing Alternatives

Raising Organic Pigs: A Guide to USDA Certified Organic Requirements

Other Publications

Harper, Allen. 2009. Producing Niche Market Pork. Virginia Cooperative Extension. <http://pubs.ext.vt.edu/news/livestock/2009/06/APS-20090610.html>

This concise article identifies some of the key issues to consider before entering the business.

Hogs Your Way. 2000. www.misa.umn.edu/Publications/HogsYourWay/index.htm

Geared to large-scale production; this publication includes farm profiles that will help with examples of fencing and shelters that will work on a small scale as well.

Kellogg, Kathy and Bob. 1985. Raising Pigs Successfully. Williamson Publishing. Charlotte, VT.

A good book for a beginner, includes personal stories, tables that help illustrate basic needs and what to expect from an enterprise, a few useful budgets and many drawings. There is a chapter on manure handling and also one on butchering. Shelter plans are included as well.

Klober, Kelly. 1997. Storey's Guide to Raising Pigs. Storey Publishing. Pownal, VT.

This book covers what you need to know to operate several types of hog operations, beginning with hogs for the family table, then covering the show ring, and finally a hog business including breeding stock.

Klober, Kelly. 2007. Dirt Hog: A Hands-on Guide to Raising Pigs Outdoors...Naturally. Acres U.S.A. 309 p.

A wealth of knowledge and interesting reading. The photos help, but this book assumes you already know something about hogs and want to explore outdoor production as an alternative to confinement. Get the benefit of Mr. Klober's years of experience, and a better understanding of the hog business, by reading this book.

Lammers, Peter, Mark Honeyman, and David Stender. 2008. Niche Pork Handbook. Iowa State University Leaflet R2361. www.ans.iastate.edu/report/air/2008pdf/R2361.pdf

A set of 30 short articles that cover many aspects of raising hogs for a niche market. Access the list from this link. Well-researched and informative.

Plain, Ron. 2010. Budgets for hog enterprises projected in 2011. University of Missouri. <http://agebb.missouri.edu/mgt/budget/swine.pdf>

Three budgets are presented: for a farrowing operation, a farrow-to-finish, and a market hog operation. Use current figures in your area to customize these budgets. Niche marketing may (or may not) improve the income figures; be sure to account for processing and marketing costs.

Van Loon, Dirk. Small-Scale Pig Raising. Storey Publishing. Pownal, VT.

Practical and informative with good illustrations and photos. This one is especially good on the home butchering chapter.

Sheep/Goats

ATTRA Publications

An Illustrated Guide to Sheep and Goat Production

Goats: Sustainable Production Overview

Dairy Goats

Dairy Sheep

Integrated Parasite Management for Livestock

Managing Internal Parasites in Sheep and Goats
Meat Goats: Sustainable Production
Predator Control for Sustainable and Organic Livestock Production
Sheep: Sustainable and Organic Production
Small Ruminant Sustainability Checksheet
Tools for Managing Internal Parasites in Small Ruminants: Copper Wire Particles
Tools for Managing Internal Parasites in Small Ruminants: *Sericea Lespedeza*

Other Publications

Belanger, Jerry. 2001. Storey's Guide to Raising Dairy Goats. Storey Books, Pownal, VT.
General information for producers of dairy goats.

Burns, Deborah, Sarah Guare and Dale Perkins, editors. 2006. Storey's Barn Guide to Sheep. Storey Publishing, Pownal, VT.

Crean, David, and Geoff Bastian. 1997. Sheep Management and Wool Production. Elsevier. Inkata Press. Practical Farming Series.

National Research Council. 2008. Changes in the Sheep Industry: Making the Transition from Tradition. The National Academic Press, Washington, DC.
A comprehensive report covering the history and current state of the U.S. sheep industry. Also includes information on breeds, health issues, and marketing.

Simmons, Paula and Carol Ekarius. 2009. Storey's Guide to Raising Sheep. Storey Publishing, Pownal, VT.
This book is a useful resource covering many aspects of raising and marketing sheep and their products. Helpful to both beginners and experienced producers.

Sinn, Rosalee. 2008. Raising Goats for Milk and Meat. 3rd ed. Heifer International, Little Rock, AR.
Written for producers with limited resources, this is a very practical book, much expanded over the previous version; don't miss the chapter on health, which includes emphasis on prevention. Educators will appreciate the format of this book, in which the 10 chapters are presented as learning guides and lessons. This is an ideal course for educators working with groups and for self-study.

Websites

American Association of Small Ruminant Practitioners (AASRP). www.aasrp.org
You can contact the AASRP to find a veterinarian in your area who works with sheep and goats.

Langston University-E (Kika) de la Garza American Institute for Goat Research.
www2.luresext.edu/goats/index.htm
This website is packed with solid information for goat producers, whether they raise meat, dairy, or fiber goats. From the home page, you can connect to the web-based meat goat training course, the online manual for conducting fecal egg counts, a nutrient requirements calculators (for balancing rations), and more. Use the search button to find information on many goat production topics.

Maryland Small Ruminant Page
www.sheepandgoat.com
This site is the most comprehensive for sheep and goat producers. The site is so extensive that using the search function is recommended; otherwise, it might take several clicks to find what you are looking for. The home page alone contains a wealth of information, including links to PowerPoint presentations and spreadsheets, the Sheep 101 and Sheep 201 courses, the Wild and Woolly Sheep and Goat Newsletter, and a reference list that includes many books, and links to many useful articles covering virtually all aspects of sheep and goat production. This portal is run by Susan Schoenian, University of Maryland Extension.

Meat Goat Management Wheel
<http://extension.missouri.edu/publications/DisplayPub.aspx?P=MP913>
The versatile, easy-to-use Meat Goat Management Wheel simplifies decisions about meat goat management and production. The wheel is a management calendar that helps you schedule tasks. It contains lots of general management information that can be adjusted for individual operations and different management styles. To order a copy, contact the University of Missouri Extension Publications or call 573-882-7216

Sheep and Goat Marketing Info
<http://sheepgoatmarketing.info>
This site is a National information resource for sheep and goat marketing, with special focus on the marketing of lamb and goat to the ethnic and religious markets.

Sheep Management Wheel
www.mnwest.edu/program-sites/pipestone/lamb-and-wool-management/wheel
The Pipestone Sheep Management Wheel is designed to make ewe flock management decisions simple and easy. The wheel is basically a management calendar. It works by setting the date you lamb, and all the management tasks that you need to do for the ewe and her lambs for the entire year are indicated on the wheel.

Southern Consortium for Small Ruminant Parasite Control
www.scsrpc.org

This site contains research and producer information on various ways to control internal parasites in sheep and goats.

501-454-1641
goats@heifer.org
www.iga-goatworld.com

Organizations

American Dairy Goat Association
209 West Main Street
P.O. Box 865
Spindale, NC 28160
828-286-3801
www.adga.org

American Goat Federation
800-951-1373 or 202-350-9065
www.americangoatfederation.org

American Sheep Industry Association
9785 Maroon Circle, Suite 360
Englewood, CO 80112
303-771-3500, ext. 32
www.sheepusa.org

International Goat Association
HPI/IGA
1 World Avenue
Little Rock, AR 72202

Cattle

ATTRA Publications

Organic and Grass-finished Beef Cattle Production
Dairy Beef
Dairy Resource List: Organic and Pasture Based
Ruminant Nutrition for Graziers
Pasture, Rangeland, and Grazing Management

Other Publications

Hobson, Phyllis. 1976. Raising a Calf for Beef.
Storey Communications.

Van Loon, Dirk. 1976. The Family Cow.
Storey Communications.

ZoBell, D., C. Burrell, and C. Bagley. 1999. Raising Beef
Cattle on a Few Acres. Utah State University Extension.
www.msuextension.org/ruralliving/Dream/PDF/cattle_few_
acres.pdf

Appendix : Species Budgets

These budgets should be used as guides. Production costs and income will vary from operation to operation.

Bees

Beginning Beekeeper Equipment

Approximate Costs for Assembled Equipment for a 10-frame Hive

Medium (Illinois) Hive Bodies

4 – 6 5/8" hive bodies (\$16.50 each)

40 – 6 1/4" frames (\$1.50 each)

40 – 5 5/8" sheets foundation (wax - \$.65 or plastic - \$.94)

1 – telescoping cover (\$17.95)

1 – inner cover (\$8.95)

1 – screened bottom board (\$14.95)

1 – entrance reducer (\$.95)

Approximate Total - \$200

Extra Equipment (Optional)

2 – 6 5/8" supers (\$16.50 each)

20 – 6 1/4" frames (\$1.50 each)

20 – 5 5/8" sheets of foundation (wax - \$.65 or plastic - \$.94)

1 – entrance or hive top feeder (\$3 to \$27)

1 – queen excluder (metal - \$9.50 or plastic - \$3.75)

Deep Hive Bodies

2 – 9 1/8" hive bodies (\$20 each)

20 – 9 1/8" frames (\$1.50 each)

20 – 8 1/2" sheets of foundation (wax - \$.99 or plastic - \$1.09)

1 – telescoping cover (\$17.95)

1 – inner cover (\$8.95)

1 – screened bottom board (\$14.95)

1 – entrance reducer (\$.95)

Approximate Total - \$135

Personal Equipment

1 – hive tool (\$6.50)

1 – smoker and guard (\$28.95)

1 – bee brush (\$5)

1 – veil (\$14)

1 – helmet (\$10)

Bees

1 – 3-pound package with queen (\$75)

Note: Nucleus hives (nucs) are small colonies of bees, usually three to five frames, and are used in queen rearing. Nucs are a great way to start a new hive because they develop faster than a package of bees, and they often can be purchased from local beekeepers. The cost for a nuc, which includes a laying queen, capped brood, and bees, is around \$100. The cheapest way to get bees is to catch a swarm!

Note: Prices are less for unassembled equipment.

Poultry

Budget for a Flock of 100 Laying Hens

Cost of Raising to Point of Lay

Chick Cost – \$2.25/each (\$225)

Est. Feed Consumption – 25 lbs. each (2,500 pounds)

Cost Starter Ration - \$0.27/pound

Total Feed Cost – (0.27 x 2500) = \$675

Total Flock Pullet Cost – \$900 (\$675 + \$225)

Note: This budget does not include the cost of housing, brooding, fencing, predator control, delivery fuel, or, most importantly, time.

Cost Eggs/Dozen

Hen Lay Rate (Avg) – 80%

Eggs/year – ((0.8 x 365 x 100)/12) = 2,434 dozen/yr

Price/dozen – \$3.50

Total Yearly Egg Income (Gross) – \$8,517/year

Hen Feed Consumption – 108 pounds/year

Lay Ration Cost – \$0.27/pound

Total Flock Feed Costs – \$2,916

Carton Cost – (\$0.12/each x 2,434 dozen) = \$292

Net Profit First Season – \$4,409

Net Profit Second Season – \$5,309 (\$4,409 + \$900)

Rabbits

Sample Fryer Rabbit Budget

Based on 20 does and two bucks producing five litters per year (seven kits per litter)

Expenses	Quantity	Price	Total	Your Estimate
Feed	5 tons	\$440/ton	\$2,200	
Health program			\$25	
Marketing			\$200	
Supplies			\$50	
Labor	150 to 200 hours			
Replacement breeding stock			\$280	
Buildings, cages, and handling facilities			\$750	
Total Expenses (not including labor)			\$3,505	

Assumed production:

35 fryers x 20 does = 700 fryers marketed

700 x 5 lbs. each = 3500 pounds

3500 pounds x \$1.20*/pound = \$4,200

*For current market prices and to find a processor/buyer see www.arba.net/processors.htm.

Income \$4,200

Expenses \$3,505

Net Profit \$695

Budget adapted from Shaeffer, R. and J. Harper. 2008. Rabbit Production. Pennsylvania State University. <http://agalternatives.aers.psu.edu/Publications/rabbit.pdf> and Smith, Tom. No date. Commercial Rabbit Production. Mississippi State University. www.poultry.msstate.edu/extension/pdf/rabbit_production.pdf

Hogs

Farrow-Finish Swine Budget, Per Sow Per Year

Assumed Production: 20 pigs per sow per year, selling at 270 pounds

Estimated Income/Sow	Per Sow	Your Estimate
Market hogs sold (5400 lbs./sow x \$55/cwt)	\$2,970	
Cull sows sold (200 lbs./sow x \$51/cwt)	\$102	
Estimated Total Income (per sow)	\$3,072	

Estimated Operating Costs

Feed (Commercial—3,726 lbs. x \$.23/lb.; DDGS—14,000 lbs. x \$.09)	\$2,117
Veterinary and medicine	71
Breeding and replacement gilts	180
Equipment operation, machine hire, and transportation	120
Utilities, insurance, miscellaneous	105
Personal Property Taxes	6
Hog facility repair and maintenance	81
Operating interest (half of operating costs x 7%)	94
Labor (20 hours x \$12/hour)	240
Total Operating Costs Including Labor	\$3,014
Income Over Operating Costs	\$58

Hog Finishing Budget, Per Lot of 10 Hogs

Purchase 50-lb. pigs; sell 270-lb. market hogs

Estimated Income	Per Lot (27 cwt.)	Your Estimate
Market hogs sold (10 x 270 lbs. x \$.55/lb.)	\$1485	
Estimated Operating Costs		
Feed: Commercial (1050 lbs. x \$.22)	\$231	
Grain and DDGS (5,200 lbs. x \$.09)	\$468	
Total Feed cost	\$699	
Purchased pigs (10 x 50 lbs. x \$1)	\$500	
Veterinary and medicine	\$40	
Equipment operation, machine hire, and transportation	\$100 (variable)	
Utilities, insurance, and miscellaneous	variable	
Personal property taxes	variable	
Hog facility repair and maintenance	\$100	
Total Operating Costs Except Labor	\$1,439 (plus variable costs)	
Income over Operating Costs	\$46	

Adapted from budgets prepared by Ron Plain, University of Missouri Extension economist.

Sheep and Goats

For more information on economics, including several example budgets and budgets you can adjust to reflect your farm's costs, see www.sheepandgoat.com/economic.html.

Simple Meat Goat Budget

Income Sell 1.25 kids/doe (1.5 kidding rate -.25 for replacement) Price \$.80/lb., 50 lbs., \$40/kid	\$50
Income/doe (1.25 kids x \$40)	
Income cull does .2 hd x \$25	\$5
Weed and brush control (save in spraying)	Unknown
Total income	\$55
Expenses	
Pasture	\$5
Fencing	\$4
Health (vaccination and deworming)	\$4
Buck service	\$3
Raising replacement	\$10
Salt and water	\$2
Winter feeding	\$10
Predator control	\$2
Total Expenses	\$40
Profit/Doe	\$15

Budget from Hart, Steve. 2000. Sustainable Brush Control. Proceedings of Langston University Fifteenth Annual Goat Field Day.

Ewe Flock, Projected Budget for Lambs Sold in 2010

Production: Flock of 100 ewes and three rams with a 140% lamb crop raised; 22 ewe lambs retained as replacements. Purchase rams at \$300 each.

Estimated Income/Ewe (lamb crop: 140%)	Spring Lambing	Your Estimate
Lamb sales: 85 lbs. @ \$100/cwt. x 1.18*	\$100.30	\$
Cull ewe sales: 125 lbs. @ \$40/cwt. x 20%	\$10.30	\$
Estimated Total Income/Ewe	\$110.30	\$
Estimated Costs/Ewe		
Operating costs		
Pasture (\$20/acre rental rate)	\$20.00	\$
Hay (100 lbs. @ \$70/T.)	\$3.50	\$
Grain (30 lbs. @ 7¢/lb.)	\$2.10	\$
Salt and minerals (10 lbs. @ 20¢/lb.)	\$2.00	\$
Dewormer (4 times/year)	\$2.00	\$
Vaccinations	\$0.42	\$
Insecticides	\$0.24	\$
Marketing and hauling	\$6.00	\$
Utilities and machinery costs	\$6.00	\$
Livestock facility and fence repairs	\$3.00	\$
Professional fees (legal, accounting, etc.)	\$0.50	\$
Miscellaneous	\$2.00	\$
Operating interest (1/2 of operating costs @ 7%)	\$1.67	\$
Total Operating Costs (except labor)	\$49.43	\$
Labor & management (3 hours @ \$11.50/hr.)	\$34.50	\$
Total Operating Costs (including labor)	\$83.93	\$
Ownership Costs		
Depreciation and interest on livestock facilities	\$6.00	\$
Interest on ewe and ram	\$8.00	\$
Breeding stock purchases	\$5.00	\$
Insurance and taxes on capital items	\$2.00	\$
Total Ownership Costs	\$21.00	\$
Estimated Total Costs/Ewe	\$104.93	\$
Income over operating costs	\$26.37	\$
Income over total costs	\$5.37	\$

Budget prepared by Ron Plain, Extension economist, University of Missouri-Columbia.

*100 ewes x 140% lamb crop = 140 lambs; 140 lambs - 22 lambs retained as replacements = 118 lambs to sell.

Dairy Goat Budget

For a 2-doe operation

Estimated Start-Up Costs

Your Estimate

Good Dairy Goat (\$250-400/each)	\$600
Buck (you can also borrow or pay breeding fee)	\$250
Equipment (Milkstand—home-built, milk pail, feeder, water bucket)	\$100
Shelter	\$100
Total start-up costs (not including fencing or space for feed storage)	\$1050

Estimated Expenses

Your Estimate

Feed	
Alfalfa Hay (2 lbs/ day x 2 does x 300 days = 1200 lbs; 1200 lbs / 60 lb per bale = 20 bales x \$8/bale)	\$160
Grass Hay (4 lbs/day x 2 does x 300 days = 2400 lbs; 2400lbs / 600 lbs per round bale = 4 bales x \$40)	\$160
Grain (3 lbs/day x 2 does x 300 days = 1800 lbs; 1800 lbs x \$.24/lb)	\$432
Total Feed Costs	\$752
(They will graze during the summer and not be fed grain and alfalfa while dry)	
Bedding	\$30
Veterinary Expenses	\$50
Total Estimated Expenses (not including labor)	\$832

Estimated Production

A gallon/day* for 250 days; ½ gallon/day for 50 days = 275 gallons/doe	550 gallons
They will feed kids for 60 days	-110 gallons
Total Salable Milk	440 gallons
*This is assuming yearly production of approx. 2200 lbs of milk. Some does will milk 3,000 lbs/year and others only 1200 lbs/year.	
1.5 kids per year	3 kids

Estimated Income

Milk (440 gallons* x \$12/gallon)	\$5,280
*Reduce this if using milk for home consumption or feeding animals	
Kid Sales	
Sold as cabrito (3 kids x 40 lbs x \$2/lb) OR	\$240
Sold as registered breeding stock (3 kids x \$150)	\$450
Total Estimated Income	\$5520-5730
Net Profit 1st Year (Income – start-up costs and expenses)	\$3,638
Net Profit 2nd Year (Income – expenses)	\$4,688

This budget assumes the sale of raw goat milk is legal in your state. This budget assumes that all milk produced is being sold. If using milk for home consumption then the quantity of salable milk will be reduced.

Budget prepared by Linda Coffey and Margo Hale.

Small-scale Livestock Production

By Margo Hale, Linda Coffey, Terrell Spencer, and
Andy Pressman, NCAT Agriculture Specialists
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