

Small-Scale Sustainable Rabbit Production

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This publication provides an introduction to small-scale rabbit production, focusing on meat rabbits and sustainable rabbit management.

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New Zealand White rabbits. Photo: Piotr Bizior, www.bizior.com

Introduction

Rabbits are raised for many different uses, and they can play an important role in a small sustainable farming operation. While the most common use in agricultural industries is for meat, rabbits also are raised for pelts, manure, show, and laboratory use. Rabbit meat is high in protein and low in fat, calories, and cholesterol when compared to most of the meats eaten in the United States (Samkol and Lukefahr, 2008).

On the international market, European countries account for the majority of rabbit production, while China ranks second (Samkol and Lukefahr, 2008); however, rabbit production has recently gained attention as an effective means of alleviating poverty in developing countries (Lukefahr, 2008). In

the United States, the meat rabbit industry was more significant around the time of World War II but has since declined. In recent years, a new movement of commercial rabbit production has increased for a handful of reasons: niche markets, feasibility of ecological management, and as a component of the Slow Food movement.

While raising rabbits is a labor-intensive endeavor, there are many reasons to consider doing so on a small farm: rabbits are quiet and small, their meat is nutritious, litters are large with short generation intervals (meaning a quick economic return), rabbits can eat waste materials, and they are efficient at extracting protein from forage (Samkol and Lukefahr, 2008). Furthermore, organic rabbit production is a relatively untapped market. Rabbit meat has great potential to feed economically

disadvantaged people and could be promoted in the United States as a healthful, natural meat and a small farm asset.

Rabbit Uses

Rabbit meat is fine-grained, lean, and mild and it can be cooked much like poultry. Meat rabbits are either sold as fryers (young rabbits at or below four or five pounds) or as stewers (older rabbits with tougher meat) (USDA-APHIS-VS, 2002). Rabbit meat is lower in fat, cholesterol, and calories than beef, chicken, lamb, pork, and turkey, while being comparable in protein (Lukefahr et al., 1998).

Rabbit manure can be a great garden fertilizer and compost ingredient, since it can be a relatively high source of nitrogen, phosphorus, and potassium, as well as a source of secondary nutrients (Kelly and Crouse, no date; Lukefahr et al., 1998). Worms can be raised in the rabbit manure to produce fishing bait and worm castings (Hemenway, 2009), and the manure can be used as a nitrogen source in thermophilic compost.

Breeds

Two medium-size breeds, the New Zealand White (NZW) and the Californian, are the most important for meat production. They have white fur that is difficult to see if a few pieces are stuck to the carcass, and they have higher meat-to-bone ratios (Spencer, 2011). The NZW is considered the best breed overall, considering mothering ability and carcass characteristics. However, crossing male Californians to female NZWs and then breeding the female from this cross back to male Californians results in larger litter sizes and heavier fryers than using straight NZWs.

Other meat breeds include Californian, Champagne d' Argent, English Spot, and Flemish Giant, but these may not receive a premium price because of the colored fur. A relatively new hybrid breed developed from crosses of Flemish Giant, Champagne d'Argent, and Californian named the Altex (a combination of Alabama and Texas, as the breed was developed between Alabama and Texas A&M), has been bred for commercial viability. This breed is more heat-tolerant and gains more weight quicker than other breeds—reaching up to 10 to 20 pounds. For more information, visit <http://users.tamuk.edu/kfsdl00/rabb.html>.

Breeds developed for fur include American

Chinchilla, Checkered Giant, Silver Marten, and Rex. The Angora was developed for wool and meat. Laboratory breeds include Dutch, English Spot, Himalayan, and Polish (Shaeffer et al., 2008). Pet breeds include Holland Lop, Polish, Dutch, and Mini Lop (www.arba.net). There are many other breeds of domestic rabbit that are raised for meat, show, laboratory use, and fur and wool production.

Housing

Rabbit housing depends on the scale and purpose of the operation. *Rabbit Housing: Hutches, Cages, Wires* by James McNitt is useful for planning and designing housing (see Further Resources). While there are many rabbit housing designs, McNitt points out a handful of basic requirements: comfort for rabbits, protect rabbits from predators and prevent them from escaping, protect rabbits from extreme weather, allow easy access to the rabbits, be easy to clean or “self-cleaning,” and, lastly, affordable to build and maintain (McNitt, 2009). It is economical to make use of any out-buildings already available on a property. Even a lean-to in warm areas can provide a roof to keep out the rain and sun, but dogs and predators could be a problem if they are not fenced out. An experienced producer with a stable market may want to build a specialized building. In areas with 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, drafts in cold weather can be a problem, particularly for newborn kits in the nest box. In fact, backyard producers often do not breed rabbits in the wintertime. Unheated rabbitries risk freezing of water supplies in cold weather. Even if the lines are heated, the watering nipples can still freeze.

Hot weather is even more of a concern than cold weather. With high humidity and temperatures above 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 reducing ammonia buildup and helping the animals stay cool during hot

Related ATTRA Publications www.attra.ncat.org

- Evaluating a Farming Enterprise
- Building Sustainable Farms, Ranches and Communities
- Agricultural Business Planning Templates and Resources
- Planning for Profit in Sustainable Farming
- Small-Scale Livestock Production
- Guide for Organic Livestock Producers
- Direct Marketing
- Selling to Restaurants
- Social Media Tools for Farm Product Marketing

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 normally house animals in all-wire cages suspended above the ground. The cages are hung at a height convenient for 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 or in specially dug pits, often sand-lined, until the manure is removed by wheelbarrow, tractor, or, in some cases, an automatic scraper.

Quonset-style cages are rounded on top and save on wire material. The placement of the 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. While 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 the rabbits cannot chew them.

On a backyard scale, a small, free-standing unit (called a *hutch*) can be built to house a few animals outside. Various publications that give designs are listed in Further Resources.

The Polyface Farm has developed a mixed rabbitry and chicken coop in which rabbits are suspended above the chickens, as well as a mobile hutch that acts similar to a chicken tractor (www.polyfacefarms.com). Raising rabbits above laying hens allows the manure to be processed by the chickens, so the hens get whatever nutrients are left over, and ammonia does not build up. The mobile pen allows for a reduction in purchased feed.

Toby Hemenway describes a system where an open box is placed underneath an elevated rabbit hutch. The box is lined with up to six inches of shredded newspaper and peat moss or dry leaves, and collects manure, urine, and spilt food. After the box is relatively full, red worms are added to the mix and then covered. A second box is set out underneath the hutch, and by the time it is ready for worms, the first box of compost should be finished (Hemenway, 2009).

Feeding

Rabbits eat only plants and are classified as non-ruminant herbivores. They recycle feed by re-ingesting the cecotropes. Cecotropes are small particles of digested food that collect in the cecum (hindgut), which the rabbit excretes once a day and then consumes. Cecatropes are sometimes called “night feces” and look softer than the round, hard pellets usually seen. Rabbits require high-fiber diets, which are bulky and low in density, unlike poultry or swine (Lukefahr et al., 2004). While purchasing commercial feed is common in commercial operations, there is an increasing amount of research being conducted on forage-based rabbits and other self-sustaining means of feeding the herd.

Commercial Pellets

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.

With a small operation, it may be economical to reduce the amount of pellets by feeding rabbits available greens. Greens and succulents include 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 are also 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. Over-feeding of fresh greens may also cause indigestion.

Forage

Rabbits can be pastured in outdoor pens placed on the ground, which allows them 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

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



An example of a movable outdoor pen designed for forage. Photo: NCAT

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 has 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.

Growing local feed for rabbits is also an option. Research has been conducted on using water spinach, sweet potato, cassava foliage, mulberry leaves, and other plants and found that such crops can replace or be combined with conventional feed ingredients (Samkol and Lukefahr, 2008). Another study claims that growing sweet potato forage along with a small amount of cereal grain for an energy supplement can be a self-sustaining program for a small farm (Lukefahr et al., 2010).

Homemade Diets

Instead of 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, 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 enteritis (diarrhea). Grain by-products that are high in fiber, such as wheat bran or wheat mill run, are also good options. 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. Rabbit diets need to have 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 non-pelleted rations than with pelleted rations. The rabbits may feed selectively, and the cage bottom and ground below can become littered with hay. Keep this in mind when considering the cost-effectiveness of feeding home-mixed rations rather than commercial pellets. It may be possible to have a feed mill custom mix a pellet ration.

Having a balanced ration ensures that diets contain the proper amount of nutrients for rabbits during different stages of growth or reproduction. The book *Rabbit Feeding and Nutrition* (see Further Resources) includes a section on ration balancing and nutrient requirements.

Reproduction

An important part of reproductive management is taking the female (doe) to the male's (buck's) 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 the process should be tried again 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 (Gill, 2004). Birth of the kits (kindling) occurs in 31 days with NZWs. A nest box 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 at kindling among the does. 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 are an appropriate number. Cannibalism by the mother is often due to poor nutrition, but sometimes it may have no apparent cause.

Rebreeding can take place about one and a half months after kindling for four to 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 maximum production (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 gender after 12 weeks to prevent fighting and inbreeding.

Management

It is important to keep production records in order to know when to carry out crucial activities such as putting in the nest box, and to aid in choosing the best replacement stock. Ear tags or tattoos are necessary with large numbers of rabbits. Sanitation is very important. When fur and dust accumulate on cages, they can be removed by burning with a propane torch. Nest boxes should be cleaned and disinfected after use (one ounce of bleach to one gallon water is a good cleaning solution).

Health

Mastitis, or inflammation of the mammary glands, is a common disease in rabbits but it is

treatable with antibiotics. The bacteria *Pasteurella* causes snuffles and pneumonia; chronic *Pasteurella* sufferers should be culled from the herd. Rabbits showing overgrown teeth, those developing sore hocks, and poor producers should also be culled.

If antibiotics are used to treat disease, a withdrawal period is required before slaughter to ensure that 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 above six pounds) culled from the herd are less valuable due to tough meat and are marketed as stewers.

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

In a plant, an automated line reduces labor for rabbit processing compared to a manual overhead track but is subject to possible electrical breakdowns and other problems. If you are planning to establish a USDA-inspected plant, contact the USDA Food Safety and Inspection Service (FSIS). There is very little information available on building plans for rabbit processing; however, much of the equipment is very similar to or the same as poultry-processing equipment. Also, since rabbits are not classified as livestock, USDA inspection is voluntary (USDA-APHIS, 2002).

Under voluntary federal inspection, each rabbit and its organs are inspected to ensure it is wholesome, free from disease, and slaughtered under USDA poultry regulations. Voluntary inspection of rabbits (along with game meats) is handled under the Agricultural Marketing Act (USDA-FSIS, 2006). Since rabbit inspection is voluntary, the federal government does not pay for inspection and the producer must cover the costs. According to the USDA-FSIS (2006), when rabbit is not voluntarily inspected, the processor is subject to Food and Drug Administration (FDA)

Rabbits do not have a heat cycle like many animals do—rabbits ovulate after mating.

inspection under the Federal Food, Drug, and Cosmetic Act. Some states only permit the sale of rabbit if it is inspected under state laws. Contact the USDA-FSIS for information on regulations in your state. Also check with any states to which you plan to ship rabbit meat.

Products other than meat include breeding stock, manure fertilizer, and worm production from the manure. Some processors sell “biologicals” after slaughter—such as brains and blood—to pharmaceutical companies.

Marketing

Marketing rabbits can be difficult and frustrating because there are few processors who buy live rabbits, and supply and demand can be unstable. In the wintertime, producers may have a more difficult time raising rabbits and supply is therefore limited. In the summertime, supply can become glutted. A market report from the American Rabbit Breeders Association is available at www.arba.net/Processors.htm. This report includes the names and addresses of processors, along with information on current prices paid for fryers and stewers.

Direct Marketing

The United States does not have a history of rabbit consumption. However, there is untapped potential, especially for the natural and organic markets. ATTRA can provide more information on organic production and certification.

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, you can start with producing meat for family or selling to neighbors and friends. Providing free samples to businesses patronized by the producer, at county fairs, and similar venues can acquaint potential customers with the product. Advertising through newspaper, radio, flyers, brochure, and the Internet can be effective. Some farms send out a newsletter to past customers describing activities at the farm and emphasizing the quality of their products.

Education helps to build a loyal customer base. Presentations to local organizations and civic groups may attract consumers interested in lowering fat and cholesterol in their diets. New social media

tools can also engage consumers with the farming operation. 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.

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.

A Rabbit Field Day at a school could provide the opportunity for people to handle live rabbits, sample rabbit meat prepared in different recipes, get pamphlets about rabbit production and qualities of the meat, and see exhibits of crafts that can be made from rabbit products, such as rugs from the pelts and rabbit foot key chains. Rabbit producers may be able to coordinate with 4-H groups or the Cooperative Extension Service in order to carry out a project of this kind.

Summary

The U.S. rabbit industry has many challenges. Rabbit meat is high in cost compared to other livestock and should be considered a luxury meat. Feasibility studies and business planning are necessary if you are planning to invest money in rabbit production. Raising rabbits is a business a producer should grow into gradually as experience increases and management improves. In many ways, rabbits are more suited for small-scale production than large-scale, industrial production.

It is difficult to automate rabbit production because they 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.

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Case Study: Seely's Ark

Beth Seely, of Seely's Ark, a commercial meat rabbit operation in Florida, started with three does and one buck a little over 20 years ago. Today, she manages roughly 500 breeding does on 10 acres of land. Seely's Ark initially marketed directly to high-end restaurants. Now, it is the only supplier of rabbit meat to Publix Super Markets, a quickly growing grocery chain in the South.

How did this successful rabbit farm get its start? Although Beth grew up on a dairy, her interest in rabbit farming didn't begin until she moved back to the country after years in the city. "Then I caught the bug! I had to farm," she recalls. Rabbits are an ideal livestock option for her because they do not require much land and are physically easier for her to handle than larger livestock. Beth started her farm with three does and one buck, and as the herd grew, so did her operation. She considers 500 breeding does to be as large as Seely's Ark can get without hiring outside help.

Like any operation, Beth faces challenges, which, she says, generally relate to the time and labor required to be successful in rabbit husbandry, developing a year-round product, and dealing with a sometimes finicky market. Another major limiting factor is that there is little automated technology for rabbit production. With a 40-day reproduction cycle, the rabbits need a lot of attention, and the process can be time- and labor-intensive.

Seely's Ark is primarily a meat operation, although they have experimented with other markets to varying degrees of success. Their location is too rural for there to be much of a pet industry, and they no longer sell rabbits to labs because the lab industry now requires rabbits that have been raised in sterile environments. They do sell some breeding stock, and because their line has been developed for best heat tolerance, they are even able to export some stock to Caribbean and

Central American countries. For supplemental income, fishing worms are raised in bins underneath the suspended rabbit hutches.

While high temperatures have allowed Seely's Ark to develop a unique rabbit operation that is successful in traditionally prohibitive conditions, they also have posed great challenges. In the early days of her operation, rabbit breeders in Beth's region stopped breeding from June through November because temperatures simply got too hot for the rabbits, which is not only a danger to their health but can also slow their growth. Through different techniques—mainly what she attributes to the "right genetic material" and a breed of rabbit specifically developed for larger sizes and higher heat tolerance (Altex, along with the traditional New Zealand and Californian)—she is able to breed rabbits nearly year-round, ensuring a continual supply for market.

Rabbits at Seely's Ark are fed a pelleted mix—developed in partnership with a local mill that now uses the same recipe as its shelf mix—that specifically takes into account the extremely high temperatures. The new mix is lower in carbohydrates, since a diet that is too high in carbohydrates can cause sickness and even death in a rabbit.

Beth admits that she has access to an ideal market—Florida has an ethnically diverse population, and most other countries don't have the same issue with eating rabbit as does the United States. In the winter especially, with contingents of Canadians and Europeans who overwinter in Florida, there is a much higher retail demand for rabbit meat.

Growing into the commercial meat rabbit industry has had its ups and downs for Beth Seely—and certainly its share of challenges—but Seely's Ark has been a consistently successful economic endeavor in a growing industry in the sustainable agriculture movement.

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Further Resources

Online Resources and Websites

AWI's Humane Husbandry Program Expands; Rabbits Hop onto the Scene. By Animal Welfare Institute. <http://awionline.org/content-types-orchid-legacy/awi-quarterly/awis-humane-husbandry-program-expands-rabbits-hop-scene>
Basic explanation of AWI's Human Husbandry Program and how it relates to rabbits.

Breed Information – ALBC Conservation Priority List. 2012. By American Livestock Breeds Conservancy. www.albc-usa.org/cpl/wtchlist.html#rabbits

Don't Tell the Kids. 2010. By Kim Severson. *The New York Times*. March 2. www.nytimes.com/2010/03/03/dining/03rabbit.html?pagewanted=1&_r=2&hp&

Life as a Polyface Apprentice. Online blog posting by apprentices at Polyface Farm. Sample blogs include:

- **Butchering Rabbits**, <http://polyfaceapprentice.blogspot.com/2009/01/butchering-rabbits.html>
- **Hare Pen**, <http://polyfaceapprentice.blogspot.com/2009/02/hare-pen.html>
- **Rabbits and Layers**, <http://polyfaceapprentice.blogspot.com/2009/01/rabbits-and-layers.html>

Meat Rabbit Breeders. <http://rabbitbreeders.us/meat-rabbit-breeders>
Online directory of meat rabbit breeders by state. Also offers information about raising rabbits, and sells various supplies.

Rabbit - Meat Enterprise Budget. 2009. By Alabama Cooperative Extension. www.aces.edu/agriculture/business-management/budgets/rabbit.php
A sample budget for rabbit meat production, in Microsoft Excel format.

Rabbit Production. 2010. Mississippi Agriculture and Forestry Experiment Station. Mississippi State University Extension Service. http://msucares.com/livestock/small_animal/index.html
This useful resource list identifies publications, fact sheets, and other resources.

Rabbits. 2012. By Agricultural Marketing Resource Center. www.agmrc.org/commodities___products/livestock/rabbits
A good resource on rabbit production that includes information on marketing and production, as well as case studies.

The Rabbit Research Program at TAMUK. 2012. <http://users.tamuk.edu/kfsdl00/rabb.html>
Gives an overview of the rabbit research program at Texas A&M University-Kingsville, and lists different publications and resources.

Rabbits - From the Animal's Point of View (Parts 1 through 5). 2009. By M. Smith, C.L. Meehan, and J.M. MA. University of California Agriculture and Natural Resources, Oakland, CA. <http://anrcatalog.ucdavis.edu/Items/8389.aspx>
A five-part curriculum developed for 4-H that can be downloaded free.

Voluntary Inspection of Rabbits and Edible Products Thereof. U.S. Law. 9 C.F.R. PART 354. http://law.justia.com/cfr/title09/9cfr354_main_02.html
The voluntary rabbit inspection law.

Organizations, Associations, and Agencies

American Branch-World Rabbit Science Association (AB-WRSA) <http://biology.csustan.edu/Biology/abwrsa>
The WRSA was created in Paris in 1976 to promote and exchange knowledge about rabbit sciences.

American Rabbit Breeders Association (ARBA) www.arba.net
ARBA has over 23,000 members in the United States, Canada, and abroad. Its website offers information and resources for rabbit breeders.

USDA Food Safety and Inspection Service (FSIS) www.fsis.usda.gov
The USDA-FSIS website provides information to protect health through food safety and is easily searchable for information.

U.S. Food and Drug Administration <http://www.fda.gov/default.htm>
The Federal Food, Drug, and Cosmetic Act page explains specifics of the act.

U.S. Department of Agriculture-Agriculture Marketing Service. 2002. United States Classes, Standards, and Grades for Rabbits. AMS 70.300 et seq. <http://www.ams.usda.gov/AMSV1.0/getfile?dDocName=STELDEV3004378>
U.S. standards and grade for rabbit meat. Includes a summary of standards of quality for carcasses and parts.

U.S. Department of Agriculture-Alternative Farming Systems Information Center. Rabbits. 2012. <http://afsic.nal>

usda.gov/grazing-systems-and-alternative-livestock-breeds/raising-alternative-livestock-breeds/rabbits
A useful list that identifies publications and online resources for rabbit producers.

Books and Other Publications

Growth of fryers reared and (or) finished using controlled grazing in movable pens. 2003. By J. McNitt, R. Way, M. Way, and I. Forrester-Anderson. World Rabbit Science. Vol. 11, No. 4. p. 189-198. <https://ojs.upv.es/index.php/wrs/article/view/507/494>

Examines the productivity of fryers kindled in hanging wire cages and then finished on pasture, kindled and reared in a pasture pen, or kindled and reared in cages, as well as the feasibility of pasture raised rabbits.

Influence of open-air rearing on fatty acid composition and sensory properties of rabbit meat. 2004. By C. Cavani, M. Bianchi, M. Petracci, T.G. Toschi, G.P. Parpinello, G. Kuzminsky, P. Morera, A. Finzi, World Rabbit Science. Vol. 12, No. 4. p. 247-258. <https://ojs.upv.es/index.php/wrs/article/view/568>

This study examines the fatty acid (FA) composition of rabbit meat from rabbits raised in open-air moveable pasture hutches.

Rabbit Feeding and Nutrition. 1987. By Peter R. Cheeke. Academic Press, University of Minnesota, Minneapolis and St. Paul, MN.
An extensive book that discusses the nutritional needs and feeding requirements of rabbits.

Rabbit Housing: Hutches, Cages, Wires. 2009. By James McNitt, PhD, Southern University Agricultural Research and Extension Center, Baton Rouge, LA. <http://www.suag-center.com/News%20Archives/Feb-Apr2009/RabbitHousingManual.html>

Raising Meat Rabbits. 2005. By Cooperative Extension Services. Cornell Cooperative Extension, Cornell University, Ithaca, NY. http://www.ansci.cornell.edu/beef/docs/raising_mrabbits.pdf
A short but useful fact sheet that includes an estimated budget worksheet.

Proceedings of the 8th World Rabbit Congress. 2004. Puebla, Mexico. <http://world-rabbit-science.com/WRSA-Proceedings/Congress-2004-Puebla/Puebla-2004-a.htm>
A collection of conference papers ranging from rabbit genetics to meat quality and processing.

Statistics on organic production of rabbits on grassland. 2002. By F. Lebas, L. Lebreton, and T. Martin. Cuniculture Paris. Vol. 164. p. 74-80.
Studies the profitability of organic pastured rabbits.

Individual Contacts

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The source of the case study, Beth Seely is a wealth of information on rabbit production.

Appendix 1: Sample Budget

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 pounds 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://extension.psu.edu/ag-alternatives/animals/rabbit-production> and Smith, Tom. No date. Commercial Rabbit Production.

Mississippi State University. www.poultry.msstate.edu/extension/pdf/rabbit_production.pdf

Small-Scale Sustainable Rabbit Production

By Anne Fanatico and Camille Green,
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