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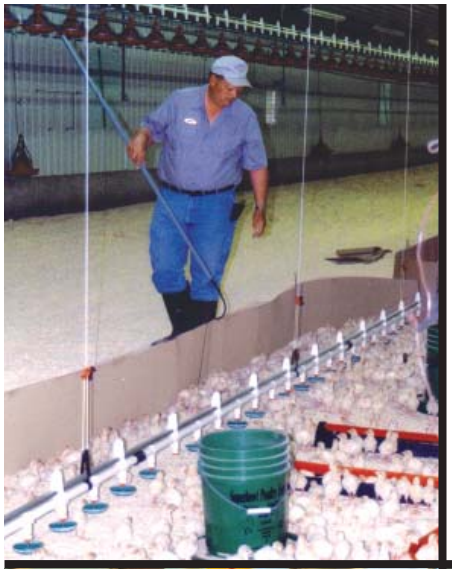
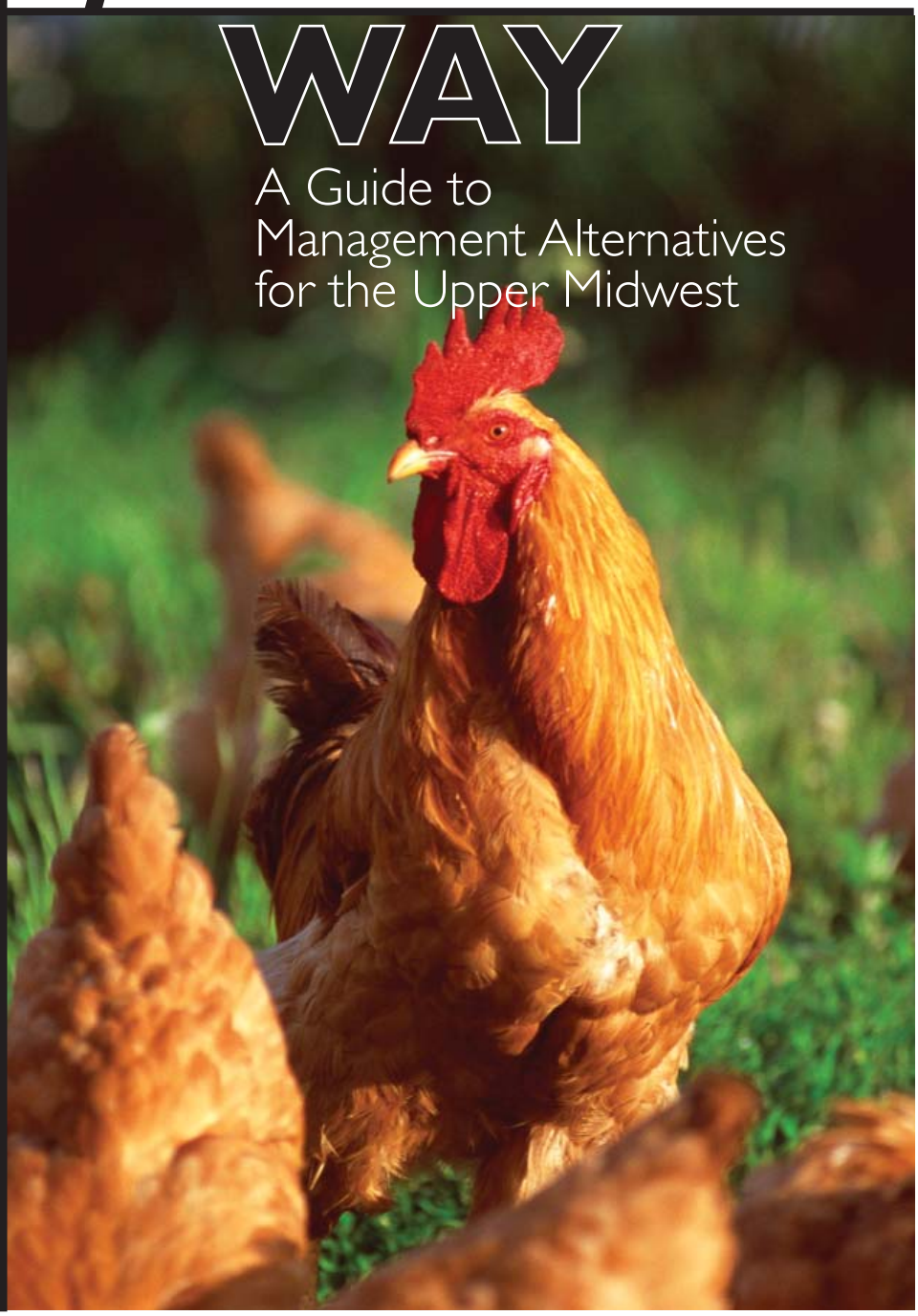


POULTRY *YOUR* WAY

A Guide to Management Alternatives for the Upper Midwest



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Funding for this project was provided by a Research and Education Grant from the USDA-Sustainable Agriculture Research and Education Program, USDA Agreement No. 2003-38640-13225.

In memory of
Ron Desens and Tom Guthrie.

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The MDA works toward a diverse agricultural industry that is profitable and environmentally sound; protects public health and safety regarding food and agricultural products; and ensures orderly commerce in agricultural and food products. Its Sustainable Agriculture and IPM Program demonstrates and promotes alternative practices that are energy efficient, environmentally sound, profitable and that enhance the creativity and self-sufficiency of Minnesota farmers. www.mda.state.mn.us

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CONTENTS

WHAT THIS GUIDE WILL HELP YOU DO

- CLARIFY your goals in considering poultry production options
- UNDERSTAND the range of options you have in the Upper Midwest
- IDENTIFY those that fit your strengths, interests, and resources
- ENCOURAGE further planning, discussion, and networking
- PROVIDE contact information to research areas of interest on your own

WHAT THIS GUIDE WILL NOT DO

- COVER every system or combinations of these used in the Upper Midwest
- PROVIDE state-of-the-art technical data
- REPLACE the expertise and counsel of breeders, nutritionists, veterinarians, accountants, attorneys, contractors, or consultants
- GUARANTEE success, sustainability, or personal satisfaction
- MAKE decisions for you

HOW YOU CAN USE THIS GUIDE

- SKIM the entire guide (to get an overview)
- READ sections of greatest interest (to satisfy an immediate need or curiosity)
- START at the beginning (to use a systematic approach to your situation).
- PERSONALIZE your guide—highlight or circle important ideas
- REFER to additional resources listed for more details to make your decision

THIS GUIDE WAS DEVELOPED TO:

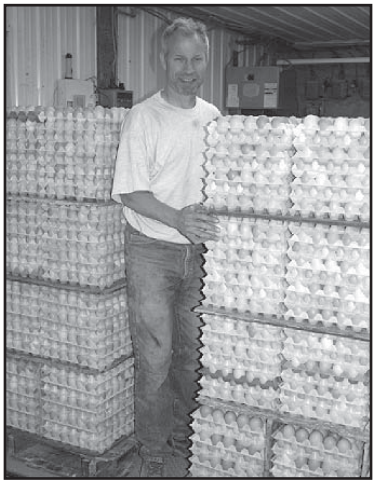
- HELP farmers compete, prosper, and create operations with mid- to long-term potential
- ENCOURAGE producers of different types, sizes, and philosophies to coexist and cooperate, recognizing that there is no single perfect production system
- OFFER options that can provide market access to smaller or newer poultry producers
- BUILD upon the expertise and experience of noted authorities, working together as an integrated team
- SUPPORT poultry production in the Upper Midwest as a vital contribution to a well-balanced economy
- HELP producers who are ready to make a change in their enterprise.

INTRODUCTION

Poultry as a New Enterprise

Thinking of raising poultry? Many farmers are interested in poultry because of its income potential and management flexibility. Poultry enterprises may be operated seasonally or year-round, full-time or part-time, on pasture or in a barn. Poultry products can be sold direct from the farm or for a premium in specialty markets where buyers seek something a little different. There's a lot to get excited about! There's also a lot to consider when it comes to marketing, processing, and production.

All poultry products must be processed at some level before they can be sold. For this reason, poultry growers must either contract with a large-scale company or arrange processing on their own. The same goes for marketing. Conventional meat and egg markets, like other agricultural sectors, are dominated by large-scale companies. Consequently, it takes a bit of footwork to successfully market poultry products as an independent grower. But, if you're willing to keep an open mind, to be creative, and to cater to the demands of buyers, poultry may become one of your most promising farm enterprises.



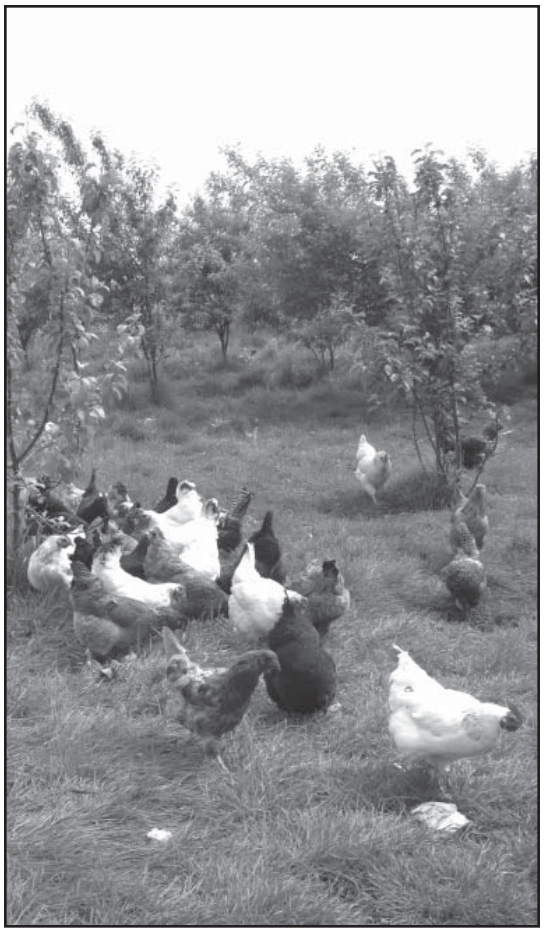
Minnesota Producer Alvin Schlangen with processed organic eggs, ready for market.

Using This Guide

Poultry Your Way (PYW) is for anyone interested in commercially raising, processing, and marketing poultry. It is designed to help you consider alternatives, and to help you make decisions about which alternative(s) will be most compatible with your family and business goals.

In the first chapter, Take Stock of Resources and Goals, you are encouraged to inventory available resources and identify goals for the poultry enterprise. Next, in Poultry Overview, we introduce and briefly describe domesticated species. Poultry species and breed choice will affect your production, processing, and marketing options.

The following three chapters are the nuts and bolts of the publication—poultry marketing, processing, and management. It may seem that we've gotten things backward. After all, you need to produce birds first before you can process and market them. We've chosen to discuss marketing first, then processing, and finally production management because this is the sequence in which you will find it necessary to make decisions. Because the poultry industry is heavily vertically integrated, growers don't have the option of producing first and waiting until slaughter time to identify a buyer and processor (as with other livestock and commodity markets). When raising poultry, it's necessary to identify markets, buyers, and processors in advance of production. You simply can't produce on a large scale without a market contract, nor can you expect to market independently without a processing plan.



Day-range chickens on pasture.

Poultry Marketing Alternatives begins with basic background information about poultry meat and egg markets—customers, products, and relative prices (when available). In **Poultry Processing Alternatives** we discuss on-farm and off-farm processing options, as well as the legal considerations associated with each. In the next chapter, **Poultry Management Alternatives**, five poultry production systems are described: (1) Industrial Management; (2) Traditional Management; (3) Day-range Management; (4) Daily Move Pen Management; and (5) Organic Management. Accompanying each management description are real-life profiles of successful poultry farmers in Michigan, Minnesota, and Wisconsin. In the profiles, growers talk about how a particular management system is working on their farm, what types of challenges they've experienced, where they market, how they get their poultry products to market, and what they might do differently next time.

Each of these three chapters — Marketing, Processing, and Management — concludes with an **Explore Your Opportunities** section, that offers suggestions to help you follow up on an idea and learn about the availability of custom processing services, for example, or about the going market price for pasture-raised chicken at your local farmers' market. The information you gather about marketing, processing, and management alternatives will help you in **Chapter Six: Select the Best Alternative**. Finally, in **Develop a Poultry Enterprise Plan**, a series of questions is presented by topic to help you work out the marketing, processing, and management details in a written plan. An extensive **Resources** section is provided as well, should you want to further explore any of the poultry marketing, processing, and management alternatives on your own.

So, whether you are a commercial farmer seeking to make better use of pastures or a new farmer interested in contract production, we encourage you to flip through these pages. Think about the marketing, processing, and management options. Read about other farmers' experiences. Check out the resources to get more in-depth information, and develop a poultry enterprise plan that best fits you and your farm.

TAKE STOCK

Your decisions about whether or not to raise poultry, how to process the birds or eggs, and where to market products will be influenced by many personal factors. Not everyone will be interested in producing 200 black-skinned chickens on pasture for the Hmong community. Conversely, not everyone will want to put up 500,000-bird broiler barns under contract with an integrator. Many opportunities will be unique to your location, markets, land, climate, skills, and goals.

The questions below are offered to help you evaluate any ideas you and your family may have for the poultry enterprise. In the chapter, Select the Best Alternative, you will use your answers, along with what you know and learn, to determine whether poultry farming makes sense for you and, if so, what your poultry enterprise might look like.

RESOURCES

Land:

Total acres owned:	Total acres leased:	Topography	Water
Tillable _____	Tillable _____	_____	Source _____
Pasture _____	Pasture _____	_____	Quality _____
Other _____	Other _____	_____	

Climate (season and number of production days)**:**

_____

_____

_____

_____

Geographic location:

- Within _____ miles of a major urban area:
- Within _____ miles of a custom processor:
- Within _____ miles of a poultry integrator:
- Other: _____

Equipment (describe size and remaining useful life)**:**

- Buildings _____
- Fencing _____
- Waterers _____
- Feeders _____
- Crates _____
- Freezers and Coolers _____
- Processing equipment _____
- Vehicles _____
- Other _____

TAKE STOCK

People (describe skills)**:**

- Family members _____
- Community members _____
- Hired help _____
- Volunteers _____
- Interns _____

Community (describe availability of the following)**:**

- Feed mill _____
- Farmers' market(s) _____
- Intermediary markets _____
  (grocers, restaurants)
- Equipment _____
- Breeding stock supplies _____
- Neighbors with experience _____
- Seasonal labor _____

Money (list value)**:**

- Total assets (farm and nonfarm) _____
- Total liabilities (farm and nonfarm) _____
- Cash available _____
- Borrowing capacity _____

Skills (describe)**:**

Have you worked with poultry? _____

Have you ever processed live birds? _____

Do you enjoy interacting with people? _____

Have you ever managed employees? _____

Do you keep good records? _____

Are you good at managing money? _____

TAKE STOCK

VALUES AND GOALS

What DO you enjoy doing? (check all that apply)

- ❑ Working with livestock
- ❑ Working outdoors
- ❑ Working together as a family
- ❑ Managing independently
- ❑ Working on a seasonal basis
- ❑ Having time to rest and take vacations
- ❑ Communicating with customers
- ❑ Recordkeeping

What types of farm work do you DISLIKE? (check all that apply)

- ❑ Working with livestock
- ❑ Slaughtering
- ❑ Working outdoors
- ❑ Managing independently
- ❑ Working on a seasonal basis
- ❑ Communicating with customers
- ❑ Recordkeeping

To me, being "successful" in farming means: (check all that apply)

- ❑ Being a steward of the land
- ❑ Satisfying our family income goal
- ❑ Creating a place for the next generation to farm
- ❑ Generating additional income
- ❑ Farming full-time
- ❑ Building new relationships outside my community
- ❑ Learning about and using new farming practices

What would you like your farm to be known for? (check all that apply)

- ❑ High quality products
- ❑ Consistent quality
- ❑ Food safety
- ❑ Organic
- ❑ Stewardship
- ❑ Competitive price
- ❑ Reliability
- ❑ Knowledgeable
- ❑ Friendliness
- ❑ Variety
- ❑ Innovation

How would you like to be known in your community? (check all that apply)

- ❑ Steward of the land
- ❑ Fair employer
- ❑ Asset to community
- ❑ Innovative
- ❑ Knowledgeable
- ❑ Good manager
- ❑ Humane caretaker
- ❑ Financially successful

Why are you considering adding poultry to your farm?

_____

_____

_____

TAKE STOCK

What is financially important to you?

- ❑ Year-round income/cash flow
- ❑ Price stability
- ❑ Limited debt
- ❑ Equity growth
- ❑ Limited risk

How much income do you want to generate from the poultry enterprise?

- ❑ Enough to pay all family living expenses
- ❑ Some extra money to supplement off-farm income
- ❑ Estimated net income ($ value): _____

Of all the things you value and enjoy, which three are the most important?

1. _____

_____

2. _____

_____

3. _____

_____

Background

Poultry nomenclature often sounds like a foreign language. Those new to poultry production may find themselves searching the dictionary to figure out, for example, just what industry terms like "capon," "broiler," and "squab" mean. Or they may find themselves wondering what the difference is between a pullet and a broiler.

If you are interested in marketing to specialty buyers it will be important to familiarize yourself with different poultry species and classes to ensure that you and your buyers are talking about the same kind of bird or product. Bird species and class will affect your marketing, processing, and, ultimately, your production management decisions.

Poultry Basics

The term "poultry" refers to domesticated birds raised for meat, eggs, and other products. Poultry are omnivores and non-ruminants. They have no teeth and, instead, use a muscular gland called the gizzard to grind their food.

Since 1946, the U.S. Department of Agriculture (USDA) has recognized six poultry species as defined in the Agricultural Marketing Act: chicken, duck, goose, Guinea fowl, pigeon, and turkey (USDA Agricultural Marketing Service, 2002). We add to this list captive game birds. Captive game birds, though not technically considered poultry, are "birds of a normally wild type, such as pheasants, quail, wild turkeys, migratory fowl, and exotic birds that are produced in captivity for slaughter and consumption" (Wisconsin Administrative Code, 2002). Many of today's poultry producers are exploring captive game production.

All live poultry are further classified by weight, breed, and age. Traditional weight classes include bantam, lightweight, medium weight, heavyweight, and ornamental. Breeds reflect genetic origin and particular physical characteristics such as shape and size. And finally, live birds are classified by age as hatchlings, pullets (young female chickens), poults (young turkeys), layers, and broilers (young chickens raised for meat) to name a few.

A detailed description of individual poultry and captive game species follows. For more information about poultry classes and breeds, check out the American Poultry Association's *American Standard of Perfection*, the American Livestock Breeds Conservancy website, and *Storey's Guide to Raising Poultry* (see **Resources** under *Species/Class/Breed Information*).

Species Alternatives

Every poultry species has unique adaptations or advantages. Some birds are known for rapid growth and pest control while others are known for their ability to survive on forage and in extreme weather. When choosing a species and breed, most poultry growers recommend that you look for high-quality breeding stock and birds that are known for disease resistance and production/feed efficiency.

Figure 1, reproduced from *Storey's Guide to Raising Ducks*, will give you a feel for the production advantages generally attributed to chicken, turkey, goose, duck, and captive game species. As an experienced producer, you may or may not have found these adaptations to be true for your flock. Remember, this is a general species comparison.

Figure 1: Comparison of Poultry Species

SPECIES	RAISABILITY	DISEASE RESISTANCE	SPECIAL ADAPTATIONS
Chicken	Fair-Good	Fair-Good	Eggs; meat; natural mothers; adapt to cages, houses or range.
Turkey	Poor-Fair	Poor-Fair	Heavy meat production
Goose	Excellent	Excellent	Meat; feathers; lawn mowers; "watchdogs;" aquatic plant control. Suited to cold, wet climates.
Duck	Excellent	Excellent	Eggs; meat; feathers; insect, snail, slug, aquatic plant control. Suited to cold, wet climates.
Pigeon	Good	Good	Message carriers; meat production in limited space. Quiet.
Guinea Fowl	Fair-Good	Excellent	Gamey-flavored meat; insect control, alarm. Thrive in hot climates.
Coturnix Quail	Good	Good	Egg and meat production in extremely limited space.

Source: Holderread, 2001.

Chickens. Chickens can be managed for both meat and egg production. In 2003, the United States produced a total of 43,958 million pounds of broiler meat and 74,404 million table eggs. The Upper Midwest (Michigan, Minnesota and Wisconsin) accounted for less than one percent of total U.S. broiler production (measured in pounds) and almost seven percent of all U.S. table egg production reported in 2003 (National Agricultural Statistical Services, USDA, 2004).

Thanks to extensive breeding and selection, Upper Midwest chicken growers have the option of raising their birds in flocks of all sizes indoors, under confinement, and, outside, on pasture. Today more than 50 breeds in the heavyweight chicken class alone have been recognized by the American Poultry Association. Specialty broiler and layer breeds have been genetically selected for rapid growth, exceptional feed efficiency, and production capacity. Some breeds are considered "dual purpose." In other words, they are relatively good egg layers but have been bred for more meaty carcasses. They are not terribly efficient at either, but farmers with small flocks often select these dual purpose birds to diversify income through both egg and meat sales.

Hen weight, egg production, broodiness, feather color, and eggshell color all vary by breed. The most common breeds chosen for commercial white-shelled egg production are Leghorn-strain crosses and hybrids. Leghorns are lightweight, prolific layers. Other popular laying breeds include the Barred Plymouth Rock and Rhode Island Red sex-links. These birds fall in the "medium weight" class and produce brown-shelled eggs. They have been crossed with other breeds to produce a good laying stock. For a list of breeds and their laying records, see *Egg Productivity by Breed* from the Sand Hill Preservation Center (in **Resources** under *Species/Class/ Breed Information*).

Broilers, roasters, and capons—otherwise known as meat birds—are classified by age, weight, and function. Broilers are young chickens (usually six to eight weeks old) that are sold in grocery stores throughout the country. Most large-scale broiler operations raise Cornish-and-White Rock Crosses (simply called the "Cornish Cross"). Roasters and capons on the other hand are finished longer than broilers—usually until eight to eighteen weeks of age. In some markets, these specialty meat birds are highly sought and command a higher price per pound (Mercia, 2001).

Turkeys. Turkey production is on the rise thanks to growing markets for year-round, ready-to-cook turkey products. In 2003, U.S. growers produced a total of 7,549 million pounds of turkey meat. Michigan and Minnesota accounted for almost 19 percent of total U.S. production (Wisconsin production was not reported separately). In fact, Minnesota ranked number one in the country for turkey production that same year (National Agricultural Statistical Services, USDA, 2004).

Turkeys can be reared in confinement (indoors) or outdoors on pasture or range (Mercia, 2001). The majority of these large birds are managed in confinement by growers who sign contracts with local integrators. In Minnesota, large-scale, commercial growers annually raise three flocks in barns that hold 15,000 birds each. Some smaller scale growers, however, still raise turkeys on pasture for very specialized, seasonal markets. In fact, heritage breed turkeys are making a comeback among gourmet customers (see Figure 2).

Turkeys can be purchased and raised as poults (day olds), starters, growers, and finishers. Commercial turkey growers typically choose Broad Breasted White turkey poults (called the Cornish Cross of turkeys). Broad Breasted White hens will reach a market weight of 18 to 22 pounds in about four months (Sustainable Agriculture Network [SAN], 2002). Toms will reach 28 to 32 pounds in the same time period and are usually finished out at 18 to 22 weeks when they weigh 36 to 44 pounds.

The age and weight at which turkeys are processed and marketed depends on the final product for which they will be used. Whole turkeys, for example, come mostly from hens and small toms that are processed when they reach 20 pounds. Large toms, on the other hand, are processed into meat products such as deli slices, breast meat roasts, and sausages.

Figure 2: Choosing a Breed

Breed selection is very important and will depend on your goals, management philosophy, and, most importantly, on your customers' preferences. Today, there is renewed interest in heirloom chicken and heritage turkey breeds for specialty markets. The American Livestock Breeds Conservancy is a nonprofit organization founded in 1977 to conserve rare breeds and genetic diversity among livestock. This organization houses a large collection of breed information on livestock breeds and genetics on its website: www.albc-usa.org. Be aware, however, that heirloom breeds grow more slowly than commercial breeds and, consequently, will require more feed to reach market weight.

Source: Polson and Fanatico, 2002.

Waterfowl. Domesticated waterfowl, namely geese and ducks, are considered easy to raise and have been widely praised for their ability to help out with pest management on orchards, nurseries, and cropland (particularly strawberry, blueberry, asparagus, onion, corn, potato, and sugar beet land).

All domesticated geese originally come from one of two species: the Asian Swan Goose and the European Graylag. According to waterfowl grower Dave Holderread, most purebred geese in North America belong to one of nine breeds. When it comes to domesticated ducks, there are 20 common breeds, nearly all of which can be traced back genetically to the Mallard. The exception is the Muscovy. Popular "heavy" duck breeds include: Pekin, Rouen, and Saxony (see Farm Profile: Alternative Species—Muscovy Duck).

In general, domesticated waterfowl are more hearty, disease resistant, and weather tolerant than chickens (Holderread, 1993). Because of their thick, well-oiled feathers and lack of exposed combs and wattles, most mature waterfowl are well suited to tolerate wet and cold weather (Geiger and Biellier, 1993a). Waterfowl require only minimal shelter, primarily from sun and extreme cold, and limited supplemental feed thanks to their natural foraging abilities.

Waterfowl, particularly geese, will eat anything from shattered grain (leftover in fields after harvest) to grasses, clovers, insects, and worms (Mercia, 2001). Weeder geese like the White Chinese and African are often turned out in orchards and newly planted fields to control insects and to weed. "These geese can eat grass and young weeds as quickly as they appear, but do not touch certain cultivated plants," note University of Missouri-Columbia animal science specialists Glen Geiger and Harold Biellier (Geiger and Biellier, 1993b). Geese also consume weed seeds, slugs, snails, and other insects, (Holderread, 2001).

The major drawback of waterfowl production is the expense associated with processing. Because of their thick down and oily feathers, waterfowl are more difficult and time consuming to process (Salatin, 1999a).

Geese foraging in barnyard.

Captive Game and Other Specialty Birds. The University of Minnesota Extension Service defines game birds as all fowl for which there is an established hunting season (Noll, 1998). Technically, they are not part of the poultry family, but a growing number of poultry producers are looking at captive game birds as an alternative niche marketing opportunity that offers lucrative supplemental income. Pheasant and quail, for instance, can sell for three to four times the price of chicken in some markets (DiGiacomo, et al., 2004).

Oakwood Game Farm in Princeton, MN.

These newly domesticated birds may be sold live for exhibition, as hunting preserve stock, as egg layers, and, of course, dressed as "exotic" or "heritage" meat. Dine out at an upscale restaurant, for example, or visit the home of a Hmong family, and you may find yourself sitting down to a meal of quail, pigeon, or partridge.

Other specialty birds, particularly within Asian markets, include squab (young pigeon) and black skinned chicken (see chapter on Poultry Marketing Alternatives for more information).

Wild game products.

Poultry farmer Joel Salatin warns that captive game take longer to reach market weight than chickens and other poultry. Moreover, pheasant, quail, and chukar are expensive to purchase as chicks, require more space, are fragile, are prone to health problems, and are cannibalistic when compared with more domesticated poultry such as chickens (Salatin, 1999a).

Productivity

You're probably wondering about flock and species productivity: How many eggs will chickens and geese lay in a year? Or, how fast will broilers and turkeys reach their market weights? Figures 3 and 4 summarize species productivity. Commercial performance numbers are cited where available (broilers and turkeys). Commercial statistics come from breeding companies.

Layers. In many countries, duck eggs are preferred for table use. In the United States, however, chicken eggs are favored by consumers and growers. White Leghorn chickens, the most common breed used for table egg production, are efficient, prolific layers.

Figure 3: Comparative Egg Production

SPECIES	AVERAGE EGG WEIGHT/DOZ. (OUNCES)	ANNUAL EGG PRODUCTION		ANNUAL FEED CONSUMPTION (POUNDS)		FEED TO PRODUCE ONE POUND OF EGG (POUNDS)	EFFICIENT PRODUCTION LIFE OF HENS (YEARS)
		#	LBS.	FREE-ROAMING	CONFINED		
Chicken, Leghorn	24	240	30	85	95	2.8-3.2	1-2
Turkey, White*	38	90	17.8	180	200	10.1-11.2	1-2
Goose, Chinese*	66	72	24.8	130	185	5.2-7.5	4-8
Duck, Campbell	31	288	46.5	110	140	2.4-3.0	2-3
Guinea Fowl*	17	78	6.9	45	65	6.5-8.7	1-2
Quail, Coturnix**	5.5	306	8.8	———	22	2.5	1

Source: Holderread, 1993.

** Turkeys, geese and Guinea fowl are not typically raised for egg production*

*** Special strains for Coturnix quail (also known as Japanese quail) are selected for egg production. Others are selected for meat production and do not lay as many eggs.*

Timing for sexual maturity varies by breed, but on average female chickens take five months to mature and lay their first egg. They typically begin producing eggs around 18 to 24 weeks of age and, if well managed, will lay 250 to 300 eggs on average per laying cycle (Bell and Weaver, 2002; Mercia, 2001). Laying cycles typically last from 13 to 15 months. Hens will continue to lay productively (three to five eggs per week) for one to two years. Proper feed and lighting are two of the most important management factors.

Meat Birds. Typical commercial growth rates and feed conversion ratios are listed in Figure 4. Broilers, as noted earlier, are extremely efficient, fast growers that perform very well in confinement and on pasture. Housing and feed are the two most important management factors affecting the growth rate of broilers and other meat birds.

Commercial performance data applicable to U.S. conditions (breeds, climate, feeds, etc.) is not readily available for alternative species such as waterfowl and captive game. For this reason, we list alternative species performance from "home-flock" production information compiled by David Holderread (Figure 5) and note the difference in broiler performance and feed efficiency for the home-flock versus the commercial flock (Figure 4).

Figure 4: Commercial Productivity — Broilers and Turkeys

SPECIES	AGE (WEEKS)	AVG. LIVE WT. (POUNDS)	FEED CONVERSION RATIO (POUNDS OF FEED/ ONE POUND OF GAIN)
Chicken, broiler	5	4.08	1.60
	6	5.30	1.73
	7	6.38	1.87
Male Turkey, B.U.T. 8 (multi-purpose)	5	3.64	1.59
	6	5.18	1.66
	16	27.76	2.42
	18	32.30	2.60
	20	36.71	2.81
	22	41.01	3.04
Female Turkey B.U.T. 8 (multi-purpose)	5	3.06	1.64
	6	4.28	1.73
	12	13.29	2.31
	14	16.18	2.54
	16	18.71	2.79

Sources: Broiler performance from Arbor Acres (www.aa-na.aviagen.com). Turkey performance from British United Turkeys Limited, 2000 (www.butinfo.com).

Figure 5: Home Flock Productivity

SPECIES	OPTIMUM BUTCHERING AGE (WEEKS)	AVERAGE LIVE WT. AT BUTCHERING (POUNDS)	FEED CONSUMPTION (POUNDS)	FEED TO PRODUCE 1 LB. OF BIRD (POUNDS)
Chicken, broiler	8	4	8.5	2.1
Turkey, White	16-20	17	55	3.2
Goose, Embden	10-12	12.2	35	2.9
Duck, Pekin	7	7	19	2.7
Guinea fowl	12-18	2.3	11	4.8
Quail, Coturnix	6	0.4	1.5	3.8

Source: Holderread, 1993.

Trenton and Gerald Dammann
Jeffers, Minnesota

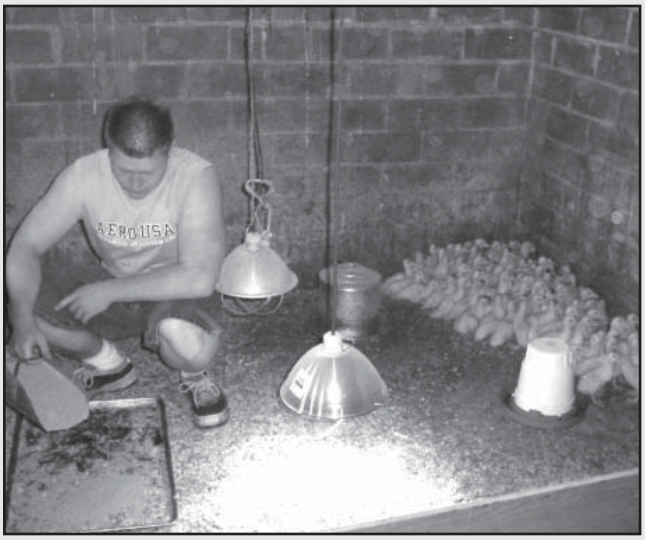
Ducks That Don't Quack — Muscovy Ducks as an Alternate Enterprise

Muscovy duck in Dammann barnyard.

Trenton and Trina Dammann took an interest in poultry when participating in 4-H projects. Their father, Gerald, oversees the agricultural program at Red Rock High School in Lamberton, Minnesota, and the family farms near Jeffers, Minnesota. When Trenton was in eighth grade, he joined FFA and wanted a project that could compete nationally. "The kids took an interest in ducks because they like waterfowl more than chickens. Besides, everyone has chickens," Gerald said. But they also wanted a different kind of duck. In the United States, the most popular breed of domestic duck is the White Pekin, a white duck that originated in China and grows to about eight to nine pounds. White Pekins are the primary duck used for retail grocery store sales. The Dammans looked into Muscovy, a species that originated in Brazil and grows up to fifteen pounds. They are primarily black and white in color and have a bright red crest around their head and beak. The Dammans learned from their customers that Hmong prefer the Muscovy (male) because of their larger size. "They kept asking us about the ducks that didn't quack," Gerald said. "We thought they were talking about the male of every breed. About a year later, we found out they were talking about Muscovys. Muscovys don't quack, they hiss." They picked up their first breeding stock of Muscovy that year. Trenton and Gerald started with 12 hens the first year, increasing to 24 hens the second year and 40 hens the third year.

Production

"Muscovys are prolific. They can hatch from 15 to 28 birds per nest. If you take their babies away, they'll take a small break, say a week, then turn around and start another nest. On the bad side, they're a late setter," said Gerald. In an average year, Muscovys don't lay eggs until May. Muscovy eggs are also difficult to hatch in incubators. One method to promote hatching allows the mother to set for two weeks, then the eggs are finished in an incubator. Muscovy can also take 32 or more days to hatch while other breeds only take 28 days. For these reasons, few hatcheries offer Muscovy hatchlings.



Trenton feeding Muscovy ducklings in brooding pens.

Housing

Like most poultry, Muscovy require a warm environment during their first week. The Dammans start their flock in May and use heat lamps with infrared bulbs. They adjust lamp height based on duckling behavior. "Are they talking a lot? Are they huddling in a big mass under the light? Too cold. Are they circled around the lamp? Too hot. Let them tell you what they like," Gerald advises.

Muscovy are slightly cannibalistic, so have to be provided sufficient room. Given adequate foraging space, Muscovy can grow to eleven pounds in twelve weeks. Gerald keeps the ducks in groups of 50 in 4 ft by 4 ft pens for the first week to week-and-a-half. Then, he doubles that space, moving them into long, narrow corn cribs until three weeks of age. Space is increased again at about six weeks of age, when he moves them to a standard old barn with a cement apron outside. Inexpensive plastic swimming

Muscovy ducks in fenced yard with pools.

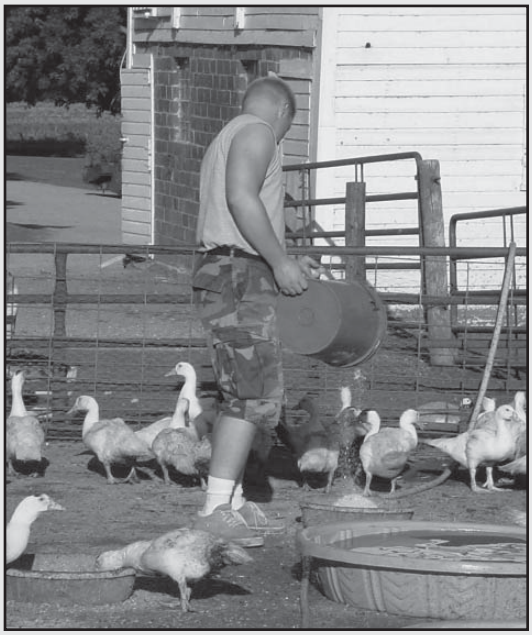
pools (one for every 100 ducks) provide the ducks with a place to swim. "When they've been in that barn for two to three weeks, eight to nine weeks of age, we'll take them back to a very large fenced area to roam at will. We don't bother to round them up at night, or pen them up," said Gerald. This fenced area is at least an acre in size and holds about 500 ducks at a time.

Muscovy also have a "bean" on the tip of their bill used for pecking out of their shell. When crowded, they use this to peck each other. "That's what you watch for when you raise a flock of Muscovy. You either trim off the bean or get them into a larger space," said Gerald. He supplies tallow from the meat locker where Trenton works, giving the ducks something to pick at. Larger producers use large, dark (red lamp lighting) buildings to lessen the pecking tendencies.

"This year (2004), we'll start them in groups of 400 so we don't tax the pens too much. We're contemplating three groups of 400." Last year, they kept back about 30 hens for hatching their own eggs.

Feed

Muscovys are omnivorous. "I'm a believer that to help cut [feed] costs you need to get them outside to hunt bugs," said Gerald. Evening feeding is generally when they forage for bugs. For the last four weeks, the Dammanns let the ducks forage at will in the fenced area, and pour out feed on the apron outside the barn twice a day. Gerald starts them out on standard Land O' Lakes "crumbles" at 22 percent protein. "Non-medicated," he advises. You don't want to feed ducks any medication [because it can lead to lameness or death]." After three weeks, the Dammanns grind corn into mash, then add poultry concentrate to bring the protein to 18 percent. At six to seven weeks, they reduce the protein level to 16 percent. At ten weeks, Gerald adds cracked corn. He only raises ducks during the summer so they can find extra nutrients by their own foraging. At the peak of production, the Dammanns feed 16 five-gallon pails of mash per day.



Mash time for Muscovy ducks.

Mortality has been low. Gerald attributes much of the mortality this last season (2003) to having too little space. Of the 525 ducks he started with, he marketed 465. About 50 percent of this loss was in the first 48 hours. To lower this mortality rate, he advises starting them in small groups and, rather than one large waterer, have several waterers spaced out over your pen. Predation is not much of an issue, but Gerald sets live traps to capture predators like raccoons. According to Gerald, it doesn't pay to keep the ducks through the winter because they don't tolerate severe cold. "Minnesota winters and open range Muscovys are not a good combination," Gerald said.

FARM PROFILE • *Alternative Species: Muscovy Duck*

Labor
Initially, ducklings need to be watched and taken care of, making sure their water is fresh and feed is plentiful. Once the ducks are foraging, the labor requirements decrease to about 30 minutes each morning and evening. "We did have to pinion the wings so they wouldn't fly and de-bean them so they wouldn't peck each other." Hatcheries will de-bean the birds for a fee. There's no need to pinion the males, which are too heavy to fly. The hens need pinioning since they are lighter and can get airborne.

Finances
In 2003 Trenton took out a $2,000 operating loan to produce 500 ducks. He was able to feed them and pay off the loan with the proceeds from their sale in August. In 2004, feed costs are higher, so it'll cost more to finish them off. They are planning on obtaining a $5,000 loan for three batches of 400 ducks.


Trenton and Gerald starting with a new batch of ducklings.

Marketing
The Dammanns market their ducks to the Hmong community at an outlet in South St. Paul. There is no processing involved, since their customers buy the ducks live and do their own butchering. The Dammanns do not sell by the pound, but get paid $8 per bird, a premium price. Gerald has researched other markets and found $6 per bird a common price. "There's no profit in $6 per bird," he concludes.

"The clientele who want these birds are interested in much more than just the meat. They use the poultry product more in depth than we do. In fact, they (the Hmong) think we're wasteful!" Gerald adds. One reason the Hmong prefer Muscovy is these ducks have less fat than other breeds.

Gerald and Trenton haul about 150 Muscovy per trip in a livestock trailer, traveling three hours to reach the market before it opens at 6:00 a.m. The ethnic market for the Muscovy may increase, as more Hmong immigrants settle in Minnesota. Still, Dammann is cautious. "I'm a little skeptical how much this market can bear. If the income isn't there, they are going to eat $3 chicken over $8 duck." Gerald doesn't think he'll produce more than 1,200 birds. His customers are the urban Hmong population, since Hmong living in rural areas usually have access to the same production possibilities as the Dammanns.

Gerald does have a few Muscovy ducks butchered for himself at a plant in Ashby, Minnesota, about three hours north of the Dammann farm. Be forewarned: Most poultry processors won't process waterfowl. It's best to check for processing availability before you venture into waterfowl.

Summer 2007 Update
The Dammanns are no longer raising ducks, since Gerald could no longer find an economical source for day-old male Muscovy ducks, and they no longer hatch their own eggs. They lost their hatchling source when the California hatchery had to close temporarily due to a salmonella outbreak. When they started back up, they no longer sold Muscovy hatchlings. The only other hatchery Gerald found that sold hatchlings had higher prices, and didn't determine sex of the hatchlings. Since male Muscovy command a much higher price than females ($4.00 more per bird), Gerald thought they wouldn't be able to make money with that source of ducklings. Gerald feels that there is still a strong desire for duck, but not at a higher price.

So although they still raise and market poultry, the Dammanns are out of the Muscovy business for now. His daughter's 4-H project involved raising Boer goats—so look for a new alternative enterprise to emerge on the Dammann farm!

MARKETING ALTERNATIVES

Background

There's no doubt about it—U.S. Department of Agriculture (USDA) projections show that Americans are eating more chicken than ever. According to USDA records, domestic per capita broiler consumption increased from a little more than 32 pounds in 1980 to approximately 55 pounds in the year 2000. By 2010, poultry consumption is expected to reach 65 pounds per capita (USDA, Economic Research Service, 2004). Driving this demand, say USDA staff, will be lower poultry prices.

These projections bode well for farmers interested in entering or expanding large-scale broiler operations, but what about the specialty producers of organic, pastured, and ethnic poultry products? Anecdotal evidence suggests that consumption of these products will grow as well. Customers in some areas are actually seeking out specialty growers—traveling to the farm for fresh, free-range poultry—and eggs appear to be no different. Certified organic farmers in Minnesota say they can sell as many eggs as they produce and in some cases have to ration eggs on market days to ensure that there are still some left for Sunday morning regulars.

New marketing opportunities are directly tied to general public knowledge and growing interest in food products that are not only safely produced, good tasting, competitively priced, and ready-to-cook, but also cater to diverse social and cultural values. Consequently, customer preferences in some areas have opened up new markets for specialty poultry such as organic chicken wings, pastured turkey, quail eggs, and Confucian-style black chicken (see Figure 6 for one example).

Figure 6: Preferences for Pastured Poultry

A total of 77 middle income men and women from Minnesota, Wisconsin, and Iowa were selected to participate in several 2002 focus groups called "Pasture Raised Products Message and Strategy." The topics of discussion at each focus group included food buying habits, knowledge of pasture-raised products, and convincing advertising strategies. Results showed that customers:

- Purchase poultry based on appearance
- Desire health benefits but not at the expense of taste
- Try new products when incentives (coupons) are offered
- Are most concerned about disease and bacteria; are less concerned with antibiotics
- Select products primarily by convenience and price
- Don't always trust their food source to provide safe, quality food (regardless of whether it's a large corporation or a local farmer)
- Feel overwhelmed by availability of advertising and other information
- Feel the name of production technique (e.g., pasture-raised, free-range, etc.) is less important than having a standard definition for a term that they can trust
- Will ultimately purchase products that offer direct benefits (low fat, healthier, etc.)

Source: Shelquist, 2002.

If you farm near an urban area, are willing to do some homework, and can keep an open mind, you may be able to cash in on local marketing opportunities and turn your poultry flock into a financially sustainable enterprise. And if you live in a predominantly rural area with a limited customer base—don't give up! You may be able to contract with an expanding integrator, pursue Internet sales, or even form a cooperative like the turkey growers of Michigan (see Farm Profile: How Cooperation Saved Turkey Farms from Death by Dis-integration).

In the following section, *Marketing Basics*, we briefly describe the need for a marketing plan. Then we discuss buyers and how to go about reaching them. Next, you'll get a brief glimpse of traditional, ethnic, and other alternative poultry products. We quote relative egg and poultry meat product prices when available. Finally, in *Legal Considerations*, state and federal food safety licensing, packaging, labeling, and handling regulations are discussed.

Marketing Basics

The market can make or break your poultry enterprise. You shouldn't consider raising birds without a clear marketing plan, particularly if you're interested in selling value-added products. Why? Because poultry is the most vertically integrated of all industries in U.S. agriculture. Until recently, farmers had few opportunities to produce and market poultry independent of the "big ten" processors (Cunningham, 1999). And while new, specialty markets have emerged, they remain small volume and quite competitive at the wholesale and retail levels.

Even if a seemingly bottomless market exists, you still need to determine how you will reach it and whether the prevailing market price is profitable for your farm. You will have meat inspection regulations and handling requirements to consider. And, if you are thinking about signing on with an integrator, you'll need to be aware of contractual obligations and expectations.

As you explore ideas for poultry production, give some thought first to who your buyers are, what type of products they want, and what they might be willing to pay. If you think you have a promising marketing opportunity on your hands, then begin talking with family and experienced poultry growers about how best to:

- Identify potential markets
- Explore market demand in different locations
- Learn about buyers' product needs and wants
- Identify products that meet buyers' needs
- Research competition
- Track market prices
- Distribute (direct, wholesale, retail, contract)
- Comply with food safety regulations
- Develop a promotional plan

Markets and Buyers

As a poultry grower, you have two marketing alternatives: You can (1) sell to an intermediary who markets your product or (2) sell direct to the final buyer. We briefly review the advantages and disadvantages of these marketing alternatives below. Take these into consideration when developing a marketing plan for your poultry products.

Intermediary Marketing. Marketing indirectly through an integrator, retailer, or cooperative has some very appealing advantages. These "intermediaries" take on the majority of distribution and promotional responsibilities, while in some cases guaranteeing prices (and your income) for the year. In return, however, intermediaries expect that products meet very specific delivery guidelines and can take a significant cut of your profit. You will be required to satisfy the needs and wants of the end market (or individual consumer) as well as the delivery and packaging needs of intermediaries themselves. Below is a brief description of three intermediary buyers: integrators, retailers/wholesalers, and cooperatives.

Integrators. The majority of today's poultry growers contract with integrators for the production of chicken broilers and turkeys. The integrator is their buyer. Integrators arrange for processing, take care of sales, and absorb market risk related to price fluctuations and demand shifts. Integrator needs and wants are outlined in formal contracts that detail bird breed, weight, "catch" date, and payment schedule. In this case, it will be very clear what your "buyer" needs and wants.

Retailers and Wholesalers. Many small-scale poultry farmers have been quite successful marketing through wholesalers and retailers such as community-oriented grocery stores and gourmet restaurants. But success does not come easy. You will need to satisfy delivery and handling requirements as well as packaging requests specific to each retailer and/or wholesaler. Moreover, you will need to keep in contact regularly with your buyers to learn about their upcoming needs and to communicate your product availability. One local chef, Mike Phillips, had this advice for farmers interested in working with chefs: stop by and introduce yourself in person; drop off samples; promise regular delivery service; and supply references. "Try to provide a consistent, high quality product. As a chef, I need to know that the chicken I served last week will look and taste the same again this week."

Cooperatives. Formal cooperatives and other collaborative marketing groups are typically owned and operated jointly by grower-members. Some cooperatives market together, others process together, and some do both (see Farm Profile: How Cooperation Saved Turkey Farms from Death by Dis-integration). In the case of marketing cooperatives, a board (composed of members) usually arranges for the sale of members' products through other intermediaries such as processors, wholesalers, and retailers. Cooperative benefits are usually distributed on the basis of use and a delivery volume may be required. You can expect to pay a fee for processing and marketing services, and you may have to purchase shares and volunteer time when joining the cooperative. Some marketing cooperatives, such as Organic Valley™ Family of Farms, may also require you to follow management guidelines. For more information about marketing through a cooperative, see *Collaborative Marketing: A Roadmap and Resource Guide for Farmers* (in **Resources** under *Marketing*).

Direct Marketing. Direct market buyers are, in some cases, the same folks who shop at large retail grocery stores. They may seek you out at the farm, at the farmers' market, or over the Internet. Most of these individual buyers are looking for a product that is different from the industry standard.

Selling direct to individuals and families via farm stands, farmers' markets, and subscription will generate more income up front. Without an intermediary to take a cut, you'll be free to pocket the full retail value for your birds and eggs. Sound too good to be true? Well it may be. Remember that marketing direct *takes time* and can be risky. What happens if your buyers head south in the middle of winter and you're left with a perishable product on your hands? Meat can be frozen, but eggs often have to be dumped if the market slows beyond expectations (see Farm Profile: "Traditional" Doesn't Mean "Old-fashioned" on the Dickel Farm). Moreover, as noted by Drake University law professor Neil Hamilton, the closer you get to the final customer, the more liability you assume for food safety. Direct market price premiums are the reward for taking on the promotion responsibilities, food safety liability, and sales risk usually adopted by intermediaries. (Hamilton and Hamilton, 2004).

Knowing your customers' preferences is of utmost importance when marketing direct. Don't assume all buyers will be alike, particularly if you intend to target ethnic markets, where cultural nuances may be subtle but significant. Minnesota farmer Gerald Dammann, for instance, says it took him a full year to figure out that his Hmong buyers were asking for Muscovy—"ducks that didn't quack." Sometimes, when selling to a large-scale integrator, for example, uniformity may be of the utmost importance. In the conventional industry, automated processing equipment is designed to handle a specific carcass size. Odd-sized birds cause problems. On the other hand, direct marketers like Ron and Sheila Hamilton of Sunworks Farm, say size variability can be a benefit because some customers prefer small birds while others prefer larger birds (Hamilton and Hamilton, 2004).

Figure 7: Ethnic Poultry Buyers

It might pay to specialize in less traditional U.S. species (e.g., squab) and breeds (e.g., black-footed chicken) in order to service a small retailer who caters to ethnic markets. Many retailers in the Upper Midwest are importing specialty poultry products from Canada and California because of the lack of local suppliers and growers. If you are willing to learn about the needs of another culture – to learn about their religious practices, holidays, and traditional meals – you may be able to earn a premium, even for parts such as chicken feet and offal that are considered unwanted in the popular market.

Hmong communities in Wisconsin and Minnesota represent one such ethnic community. Hmong prefer whole birds: skin, fat, organs, and all. They also prefer fresh, custom-butchered meat that they can share with their extended families. Research conducted by Cooperative Development Services on behalf of the Minnesota Food Association found that Hmong prefer not to buy popular brands of chicken but prefer to eat meat that is leaner and tougher than conventional meat. They prefer a variety of black chicken with black feet. Somali and Hispanic communities may represent other poultry marketing opportunities in the Upper Midwest.

Source: Cooperative Development Services, 2001.

Always talk with your prospective buyer to learn about his or her preferences for different species, breeds, taste, freshness, bird color, processing, dressed weights, and packaging, as well as needs for seasonal or holiday meals. Packaging, labeling, and the language used to describe your products can significantly affect sales. Words such as "pastured" or "organic" may appeal to one group but turn off another (see Figure 8).

Figure 8: "Free-Range" May Not Be Best Choice of Words

When asked about the terms free-range, pasture-raised, grass-fed, and natural, a group of 77 Midwest consumers said free-range was not their first choice. They largely associated the term with chickens, but some mentioned western range-fed cattle. Respondents had clear ideas about what this term means, some positive, but most said this term adds little or no value to the product. A few said it might even reduce the value of the product as the term has negative connotations for them. One respondent said, "I see tough, stringy little chickens." The term "pasture-raised" was favored by this focus group. Your customers may not be averse to the term "free-range," but the term "natural" or "home-raised" might turn them off. It's your job as a direct marketer to find out. Try asking. You'll learn a little more about your customers and they'll learn a little more about you. It's a good opportunity to educate them about how you produce the meat and eggs they enjoy.

Source: Shelquist, 2002.

As an independent marketer, you must identify customers' needs and wants. Don't rely on a hunch or even advice from your neighbor. Expect to invest time and effort learning about buyers, because it is critical for business. Make phone calls, visit farmers' markets, or conduct your own survey of retailers. Every buyer is unique; communication is the only way to really "know your customer" and ensure future sales for your poultry enterprise.

Poultry Products

When you hear the words "poultry products" you probably think "chicken" and "eggs." Chicken and eggs remain staple products in most American households and are considered commodities by many in the agriculture industry. At the same time, however, chicken, eggs, and other poultry products are becoming more differentiated—that is, eggs and poultry meat are now distinguished by management practice, taste, packaging, and health attributes. Gourmet markets exist for "exotic" meat that comes from captive game and heritage turkey breeds, as well as certified organic and "pastured" poultry farms. The egg market, too, is now broken up into niches for brown-shelled eggs, duck and quail eggs, organic eggs, Omega-3 enriched eggs, and even blue or colored chicken eggs from breeds like the Ameraucana.

Additionally, some growers are developing markets for such products as composted manure, captive wild game stock, exhibition-quality birds, and even specialty feather production. In Minnesota, for example, one poultry producer arranged to sell turkey necks, with feathers intact, to the owner of a local sporting goods store for the manufacture of fly fishing lures. Don't be afraid to explore or create new markets.

Below is a brief background of poultry egg and meat products as well as relative prices when available. Use this information as a starting point. Then do your own research to learn about product demand, competition, and marketing opportunities in your area.

Table eggs. Farm-fresh eggs are usually one of the first things to sell out at farmers' markets. On average, every American consumes 250 eggs annually (USDA, Economic Research Service, 2004). That's a lot of eggs! If you're thinking about tapping into this market be sure to explore customer preferences for egg variety (chicken, goose, duck), color (white, brown, blue), nutritional content (Omega-3, cholesterol—see Figure 10), size (small, medium, large, extra-large, jumbo) and packaging (bulk, half dozens, recycled packaging). All retail eggs come sized and graded by freshness, interior egg quality, and shell appearance.

Pease eggs at Minneapolis Farmers' Market.

The majority of white-shelled eggs typically found in supermarkets across the country come from large farms with in-line processing (where eggs move directly from birds through processing to egg cartons). These eggs have a lighter colored yolk than eggs coming from pasture-raised birds. Conversely, eggs from hens raised on pasture (where they consume legumes, grass, and insects) often have orange yolks. Some growers and consumers say these eggs have more flavor than eggs from non-pastured birds (see *Pasture Perfect: The Far-Reaching Benefits of Choosing Meat, Eggs and Dairy Products from Grass-Fed Animals* in **Resources** under *Poultry Products*).

Figure 9: Nutritional Content of Eggs

TYPE OF EGG	PROTEIN (g)	FAT (g)	CHOLESTEROL (mg)	CALORIES (per 100 grams)
Chicken	12.6	9.9	423	147
Quail	13.1	11.1	844	158
Turkey	13.7	11.9	933	171
Duck	12.8	13.8	884	185
Goose	13.9	13.3	852	185

Source: Tecstra Systems Corporation, 1999.

Buyers are willing to pay more for egg shell color, nutritional content, and even management practices such as organic and pastured poultry. Eggs advertised as having a higher Omega-3 content, for instance, sell for twice the price of standard white-shelled eggs. Certified organic, Omega-3 enriched eggs sell for four times the price of standard white-shelled eggs (see Figure 10).

You should know, however, that specialty product premiums carry a price of their own. Truth in advertising laws require that any product claims you make must be accurate and verifiable. In order to advertise your eggs as Omega-3 enriched you must have each batch of eggs tested to verify your claim. Likewise, organic eggs must be certified and come from hens that are fed higher priced organic feed and allowed access to the outdoors (see *Organic Management* in the Poultry Management Alternatives chapter for information about organic certification requirements). Do your homework to find out which product premiums truly pay.

Figure 10: Relative Prices of Table Eggs

BRAND	LABEL CLAIM	% ABOVE BASE PRICE	RELATIVE PRICE ($/BASE PRICE)
Byerly's	Grade AA, large, white	BASE	BASE
Sparboe Farms	All-natural Grade A, large, brown	56	1.5
Sparboe Farms "Egg Sense"	All-natural, Omega-3 (250 mg), cage-free, brown	99	2.0
Sparboe Farms "Egg Sense"	All-natural, Omega Plus (250 mg Omega-3), white	125	2.3
Larry Schultz	Organic, brown	151	2.5
Egg Land's Best	Cage-free, vegetarian-fed, Omega-3 (100 mg), brown	160	2.6
Larry Schultz	Organic, extra-large, brown	160	2.6
Promised Land	Organic, AA, brown	238	3.4
Organic Valley	Organic, brown	247	3.5
Organic Valley	Organic, Omega-3 (225 mg), brown	298	4.0

**All prices for Grade A, large eggs unless otherwise noted.*
Source: Collected at Byerly's Retail Grocery Store, Minnetonka Location, June 14, 2004.

Poultry. Poultry may be sold whole or cut-up, fresh or frozen. The majority of chickens (90 percent) and turkeys (50 percent), however, are sold cut-up as wings, thighs, breasts, and legs, owing to the rise in consumer demand for convenience foods (Olinger, et al., 2000). This means that as a farmer or processor, you will need to invest more time preparing your meat for the market unless you can tap into specialty or ethnic markets that demand whole or live birds (see *Farm Profile: Alternative Species—Muscovy Duck* for an example of live market sales).

Figure 11: Fresh vs. Frozen Poultry

Fresh and frozen poultry are two different markets and require different distribution channels. Consumers are accustomed to seeing only fresh meat in most supermarkets, but many natural foods stores do not have a fresh meat counter. Restaurants usually prefer fresh meat delivered once or twice weekly. You can sell fresh meat to restaurants and market frozen meat as a secondary product to other channels. There is a stigma against frozen meats, but it may be possible to establish a marketing strategy that promotes a frozen sustainable product over a fresh, unsustainable product.

Source: Fanatico and Redhage, 2002.

Poultry meat from broilers managed in confinement is considered fat or juicy, and tender, when compared to meat from birds raised on pasture (Lehnert, 2002). That said, birds raised on pasture are characterized by some as "more flavorful." As with eggs, some buyers are willing to pay more for perceived taste, health, animal welfare, and environmental benefits.

In Minnesota, certified organic fresh whole chicken sells for almost twice the price of regular fresh whole chicken at the same retailer quoted for egg prices (see Figure 12). In East and West Coast markets, Rodale's New Farm Price Index reported organic broiler prices that were almost double conventional prices during May 2004. Products from chickens raised on pasture often sell for prices between conventional and certified organic prices.

Figure 12: Relative Poultry Product Prices – Meat

BRAND	TYPE OF BIRD	LABEL CLAIM	% ABOVE BASE PRICE
Gold'n Plump	Chicken	All natural (no hormones, preservatives), whole bird fresh	BASE
	Chicken	All natural (minimally processed, no artificial ingredients, no antibiotics), vegetarian grain-fed, air-chilled	11
Kadejan	Chicken	All natural (minimally processed, no antibiotics, growth stimulants or animal biproducts), free-range, whole bird, fresh	38
	Chicken	Organic, free-range, air chilled, whole, fresh	94
Honeysuckle White	Turkey	Premium quality, young, whole, frozen	BASE
	Turkey	Young, whole, frozen	16
Empire Black	Turkey	All natural (minimally processed, no preservatives), young, whole, frozen	132
	Cornish Rock Game Hen	Whole, frozen	BASE
Maple Leaf Farms	Duckling	Whole, frozen, with orange sauce packet	9
	Pheasant	Whole, frozen	225
Manchester Farms	Quail	Farm-raised, jumbo, whole, frozen	315

Source: Collected at Byerly's Retail Grocery Store, Minnetonka Location, June 14, 2004.

The USDA groups poultry into "ready-to-cook" categories for grading and marketing purposes. Categories are determined by the bird's age at slaughter and by meat tenderness. "Fryers" belong to one category while "roasters" belong to another (USDA, Agricultural Marketing Service, 2002). It is your job to find out what type of bird (species, breed, age, size), texture and flavor your customers prefer, as well as how much they are willing to pay for the difference.

Legal Considerations

Products that come from animals are perishable and what regulators call "potentially hazardous foods." This means that disease-causing bacteria will multiply quickly unless controlled (Lehnert, 2002). For this reason, state and federal food safety rules have been designed to protect consumers from food-borne pathogens. Food safety rules control which products must be inspected, as well as how they should be packaged, labeled, and stored. In short, regulations limit what you can sell and where. **You must check with the regulatory agency in your state to determine the rules you must follow** (see Figure 13.)

Packaging and labeling. Farmers who sell eggs generally are permitted to use secondhand cartons as long as the cartons are clean and information relating to the original packer is removed (particularly pack dates and freshness dates). In Michigan, however, growers are strongly encouraged (though not required) to purchase new cartons when selling eggs anywhere off the farm. If you do recycle cartons, new labels with the farm name, address, egg grade, egg size, pack date (in Julian calendar format with 1 to 365 days) and a "freshness" or expiration date (not to exceed 30 days from the pack date) must be added when selling through a retailer. Moreover, the following safe handling language is legally required by the Food and Drug Administration on all cartons packed for retail sale: "To prevent illness from bacteria: keep eggs refrigerated, cook eggs until yolks are firm, and cook foods containing eggs thoroughly." While this may seem cumbersome, it is law and will afford you some legal protection should a customer become ill due to improper handling. Preprinted handling labels describing how to store and prepare eggs are available from www.eggcartons.com.

Packaging regulations for poultry and other meat products were established to maintain freshness, quality, and food safety. Packaging chemicals and colorants can migrate to food and for this reason are considered an indirect additive. All additives must be approved by the U.S. Food and Drug Administration (FDA). Poultry and other meat processors are required to use FDA-approved packaging materials and maintain on file a "statement of assurance" or guarantee from the packaging supplier to verify that packaging meets codes under the Federal Food, Drug and Cosmetic Act (USDA, Food Safety and Inspection Service [FSIS], 2000).

Desenses' organic chickens for sale at the Minneapolis Farmers' Market.

All poultry meat packaging must be labeled with the product identity and the state or federal processing inspection label (if applicable). Product identity includes the name, address, and zip code of the farmer, packer, or distributor. All labels must be submitted for approval to the respective state or federal inspector at the processing plant (where applicable) prior to using the inspection legend on any packages (MDA, www.mda.state.mn.us/dairyfood/factsheets/eggsafety.htm). Additionally, federal law created under the Nutritional Labeling and Education Act, states that all processed products must include a nutritional label on the packaging. There is a small business exemption, however, that applies to the majority of farmers who direct-market their products; nutritional labels are not required if the farm's total annual sales (of food and nonfood products) totals less than $500,000 per year, or if the total annual food sales amount to less than $50,000 per year (Hamilton, 1999) (see **Resources** under *Labeling*).

Handling and Storage. Most states have storage and handling guidelines for poultry, eggs, and meat products. Guidelines state that all eggs, for example, must be refrigerated at 45 degrees F or less after grading and be maintained at this temperature during storage and handling (MDA, www.mda.state.mn.us/dairyfood/factsheets/eggsafety.htm). If you intend to sell your eggs and meat off-farm, be sure you have the proper equipment to keep products cool during transport and while at the market if you sell direct. Equipment need not be fancy. In some states, like Wisconsin, a cooler is all that is needed. In other states, such as Minnesota, you may be required to use mechanical refrigeration. **Check with your state Department of Agriculture to verify local requirements.** Moreover, make sure your buyers know how to store and cook products properly. The USDA Food Safety and Inspection Service offers clear, well-written fact sheets about food handling in consumer language (See *Basics for Handling Food Safely* in **Resources** under *Food Safety*).

Licensing. Farmers who sell eggs from their farm are exempted from obtaining a food handler's license. In most states, a handler's license will be required when selling eggs through an intermediary (retailer, wholesaler, restaurant) or even at a farmers' market. Retail buyers, in particular, are obliged to purchase products only from "approved" sources (in other words, from licensed handlers). Food handler's licenses are renewable annually. Applications can be obtained by contacting your state department of agriculture (see Figure 13).

Frozen chickens for sale at Minneapolis Farmers' Market.

Figure 13: State Food Handler Licensing Contacts

The following agencies are responsible for ensuring food safety at the state level. For accurate information about food-borne illnesses, food handler licenses, and regulations, contact a department official in your state.

Michigan:	Michigan Department of Agriculture, Food & Dairy Division PO Box 30017, Lansing, MI 48909 (800) 292-3939
Minnesota:	Meat, Poultry, and Egg Inspection Division, Minnesota Department of Agriculture 625 N. Robert St., St. Paul, MN 55155 (651) 201-6027
Wisconsin:	Wisconsin Department of Agriculture, Trade and Consumer Protection for Meat PO Box 8911, Madison, WI 53708-8911 (608) 224-4700

Explore Your Alternatives

Think you have good idea for marketing your poultry products? We recommend putting together a marketing plan. Include in it a description of customer(s), competition, market trends, products, distribution alternatives, pricing options, and advertising ideas (see Figure 14).

Identify your buyers first to find out what they need *before* putting together a product list or exploring production alternatives. Every buyer is different. Next, research your competitors and local prices. This step may be as simple as visiting your local grocery store or paging through the *Michigan Farm Market, U-Pick and Ag Tourism Directory* (www.michigan.gov/mda), the *Minnesota Grown Directory* (www.minnesotagrown.com) and the *Something Special from Wisconsin Directory* (http://www.savorwisconsin.com/). You may be surprised at how many other growers have already put your idea into action! Find out who else is in the market and what they offer. This research will help you determine market viability for birds, eggs, and other poultry products.

Figure 14: What's a Marketing Plan?

A marketing plan details your knowledge of the market, your customers, and their wants. It should describe your product and how it meets the need or preference of your target customers. Additionally, marketing plans typically include information about competitors (are there any and, if so, how will you compete?), your pricing strategy, promotional ideas, and distribution plan. The outline below should help get you started.

- MARKETING GOALS
- CUSTOMER DESCRIPTION
- COMPETITOR DESCRIPTION
- PRODUCT DESCRIPTION
- PROMOTIONS AND DISTRIBUTION STRATEGY
- PRICING OPPORTUNITIES AND PLANS
- SALES PROJECTIONS
- BREAK-EVEN ANALYSIS TO DETERMINE MINIMUM SALES VOLUME

Source: DiGiacomo, et al., 2004.

Once you have a feel for which products to market and how much they will sell for, try to develop sales estimates. Calculate your expected annual or monthly sales volume and gross sales revenue. You'll need this information later to make decisions about whether or not to expand your current poultry enterprise or to start something new.

For more information about putting together a marketing plan and developing sales estimates, see the National Center for Appropriate Technology (NCAT) publication *Growing Your Range Poultry Business: An Entrepreneur's Toolbox* or the Minnesota Institute for Sustainable Agriculture's *Building a Sustainable Business: A Guide to Developing A Business Plan for Farms and Rural Businesses* in **Resources** under *Budgeting, Enterprise Planning and Recordkeeping*. Both of these publications offer excellent market research suggestions.

PROCESSING ALTERNATIVES

Background

Once you know more about your buyers, what products they like, and what they're willing to pay, it's time to think about how you will get your eggs and/or birds ready for the market. In other words, how will you process and package? Will you hand-clean and candle eggs? Is there a custom facility located nearby for turkeys? Will you process broilers on-farm? More importantly, do you *want* to process on-farm? Or as one experienced producer asks, "Does the smell of wet feathers and chicken guts bother you?" (Callister, 2004).

Processing means making your poultry customer- or kitchen-ready. Table eggs and poultry meat can be processed on the farm or off-farm through a small-scale facility.

If you're looking at processing birds in small batches, on-farm processing may be an economical as well as necessary option. According to Anne Fanatico, "There are very few independent government-inspected processing plants where producers can take their birds for processing, and large-scale integrated companies do not process for independents" (Fanatico, 2002a). Census data confirms that more than 60 percent of all chicken and turkey processing plants exited the industry during the 1967-92 period — most of them small capacity plants. The majority of processing takes place at large-scale plants owned by integrators. Consequently, many farmers interested in raising small flocks or farming independently from integrators, do their own processing on the farm.

In the next section, we discuss egg processing basics, on-farm processing, and legal considerations associated with egg-processing. Then, poultry meat processing is addressed in the same manner, beginning with an overview of poultry meat processing basics (what's involved in processing live birds), how producers are processing on-farm, and what options they have for hiring the work done off-farm. In addition, we briefly describe licensing and other legal considerations associated with processing birds on- and off-farm.

Table Eggs

Egg processing refers to the collection, cleaning, candling, grading, sorting, and packing of fresh eggs. Some eggs are processed into "value-added" products such as dry whole egg powder or frozen egg whites for use by food manufacturers and commercial bakers. Most of this processing is done commercially, not by individual farmers. For this reason, the processing information presented below is limited to table eggs — eggs sold fresh in cartons.

Processing Basics. Cleaning, candling, and grading are what you might call egg processing "basics." These are also the most labor-intensive activities. Legally, you can do all of this processing work on the farm in your kitchen. Additional information about these and other processing basics can be found in **Resources** under *Processing*.

Cleaning. Although management practices dramatically affect the number of eggs requiring cleaning, on average approximately 30 percent of your eggs will require cleaning to remove dirt, fecal contamination, and blemishes (Plamondon, www.plamondon.com/poultryfaq.html). They may be cleaned using "dry" or "wet" methods. The traditional dry cleaning method, preferred by many producers and packers because it does not remove eggs' outer cuticle or protective waxy layer, can be done using an "abrasive" such as a plastic brush, loofah, or sanding sponge (see **Resources** under *Suppliers*). Wet washing is done by rinsing eggs with running water that is 20 degrees F warmer than the egg (bacteria can migrate through the shell when cooler water is used) (Fanatico, 2003b). Some producers use hydrogen peroxide, commercial dishwashing powder, or bleach to clean eggs. Be sure to use USDA-approved products and to follow package recommendations. Moreover, be careful about using these cleaning aids if you plan to sell your eggs in specialty markets. Check with your state Department of Agriculture or organic certifier to learn more about what is permitted in your situation.

Candling. Candling, the use of a light to see through egg shells, is a well-known method for checking interior egg quality and fertility. Farmers use candling equipment to check eggs for cracks, blood spots, embryo development, and air cell size (air cell size measures freshness). Brown eggs are considerably more difficult to candle because blood spots tend to blend in and air cells are harder to detect. Candling is not necessary when selling eggs on the farm, or in some states, such as Wisconsin, when selling to your customers at farmers' markets. Be aware, however, that brown eggs have a higher tendency for blood spots and a single "bad" egg can turn off customers. For this reason, candling, even though not required, may be a good idea.

Processing and sorting for sale on Schlangen's farm.

Grading. Eggs may be graded as AA, A, and B and are sized by weight. Grades represent egg freshness (interior egg quality), egg shape, and shell appearance. Grade A and AA eggs have a minimal air cell, a clean shell with no cracks, ridges, stains, rough texture, or other "defects." They must be uniform in size to fit cartons. Grade B eggs may be sold at farmers' markets. Only grade A and AA are permitted for sale to commercial buyers. Egg size is determined by weight. The four weight classes most commonly found in supermarkets are: Jumbo, Extra-large, Large, and Medium. For more information about how to determine egg grade and size, contact your state Department of Agriculture or consult the USDA's *Egg Grading Manual* (see **Resources** under *Grading*). Some states offer grading workshops and a free air cell gauge that can be used to determine egg freshness.

On-Farm Processing. What do you need to process eggs on the farm? Not much unless you plan to handle hundreds of eggs or more each day. Most cleaning is done by hand in the kitchen on farms with smaller flocks. The work can be tedious, but has the advantage of requiring little equipment (Plamondon, www.plamondon.com/poultryfaq.html). Wet washing can be done using running water in the sink (submersion is not allowed). Dry washing is done by hand with the following supplies: plastic brushes, scrubbing pads, egg soap or cleaning powders, baskets, and scales. For packaging you'll need egg cartons or flats and labels.

Automated equipment is also available to help with both wet and dry cleaning if you process on an intermediate scale. Egg processing machines are designed to handle between 200 to 2,500 eggs per hour. Some of these machines will candle, sanitize, and grade. Most of them can handle chicken, duck, goose, turkey, and quail eggs. This technology does not come cheap, however. NCAT Agriculture Specialist Anne Fanatico has reviewed small- and intermediate-scale cleaning equipment in an *APPPA Grit* article, *Egg Processing by Hand*. Contact the American Pastured Poultry Producers Association (see **Resources** under *Agencies and Organizations*) for a copy of the article. As with cleaning, candling can also be done by hand with the help of simple equipment. Hand-held candlers are available (see **Resources** under *Suppliers*).

Legal Considerations. Technically, table eggs are considered a raw agricultural product and therefore are exempt from licensing obligations (Kevin Elfering, Dairy, Food and Meat Inspection Division, MDA, personal communication, 2004). This doesn't mean, however, that table eggs aren't subject to regulation. Federal and state regulations concerning egg processing are fairly straightforward. Food regulators consider eggs a raw agricultural commodity or a product of the farm, and exempt from licensing laws. However, federal egg processing guidelines, created under the federal Shell Egg Surveillance Act, govern the registration and inspection of egg producers who manage large flocks of 3,000 or more hens. Similarly, state guidelines apply to producers who market eggs from flocks of less than 3,000 hens (see Figure 15).

Figure 15: Federal and State Egg Processing Registration Requirements

Information applies to chicken, turkey, duck, geese, and quail eggs.

Large Flock Owners (more than 3,000 hens)
Producers who own 3,000 layers or more and market eggs are required to register with their state Departments of Agriculture. The federal government does not require a processing license but all registered farms are inspected four times each year in accordance with the Shell Egg Surveillance Act. Federal inspections are concerned with facility sanitation and are usually carried out by state Department of Agriculture employees. In some states like Minnesota, laws require additional inspections to ensure egg grading is performed correctly.

Small and Medium Flock Owners (3,000 hens or less)
Small- and medium-size flock owners are not required to file for a federal or state processing license nor are they required to register as stipulated under the federal Shell Egg Surveillance Act. In Wisconsin, producers are permitted to sell an unlimited number of "nest run" or ungraded eggs on the farm without needing any sort of handling license (see Poultry Marketing Alternatives under *Legal Considerations*). However, small- and medium-size flock owners who wish to sell through retail outlets are responsible for registering with their state Department of Agriculture to become an "approved source." Retailers are permitted to purchase eggs only from approved sources.

Source: Kevin Elfering, Dairy Food and Meat Inspection Division, MDA, Personal Communication, 2004.

State guidelines concern egg cleaning, grading, packing, labeling, and handling. Grading guidelines apply to all producers (large or small) who sell eggs at farmers' markets and through retail outlets. Generally, all eggs sold off-farm must be graded, although some states, as Wisconsin, allow the sale of ungraded or "nest-run" eggs on the farm and at farmers' markets (so long as they are labeled as such). Farmers may do their own grading. Packaging, labeling, and handling are discussed in the chapter on Marketing Alternatives under *Legal Considerations*.

Contact your state Department of Agriculture to learn more about egg processing requirements in your area.

Figure 16: State Contacts for Egg Processing and Registration Questions

Michigan:	Michigan Department of Agriculture, Food & Dairy Division 350 Ottawa Ave. N.W., Grand Rapids, MI 49503 (517) 373-1060
Minnesota:	Dairy Food and Meat Inspection Division, Minnesota Department of Agriculture 625 N. Robert St., St. Paul, MN 55155 (651) 201-6027
Wisconsin:	Grading, Labeling and Evaluation, Wisconsin Department of Agriculture 2811 Agriculture Drive, PO Box 891, Madison, WI 53708 (608) 224-4714

Poultry

Many poultry growers seek to add value to their birds before marketing. Processing can be done on- or off-farm. Most growers who process their own birds on-farm do so out of necessity. There are few custom slaughter facilities and even fewer organically certified ones.

New on-farm processing building on Jones farm (see Farm Profile: Managment Alternatives–Day-range).

To some, poultry processing includes everything from catching the birds to cleaning up after the last one has been packed and labeled. The Wisconsin Department of Agriculture, Trade and Consumer Protection (WDATCP) defines meat processing as "cutting, grinding, manufacturing, compounding, intermixing, or preparing meat or food products" (University of Wisconsin Extension and WDATCP, 2003). We review these basics, then look at on-farm and off-farm processing options. We follow with a discussion of legal considerations, primarily what kind of inspections and permits you will need to obtain in order to market your product. **You should contact your state department of agriculture early in the process of exploring processing options**, to make sure you're on the right track. Different types of inspection are explained in Figure 19. Your department of agriculture will advise you about inspection requirements based on your envisioned operation and marketing plan. Prepare to invest a significant amount of time getting established: all on-farm processors need to register with their state department of agriculture, develop a processing plan, and, presumably, learn some new skills!

Processing Basics. All birds, whether they are chickens, turkeys, or pheasants, are processed similarly. The same activities must be performed to get your birds ready for market. NCAT Specialist Anne Fanatico (Fanatico, 2003a) describes processing basics as:

- Immobilizing and stunning
- Bleeding and blood recovery
- Removal of feathers through scalding and picking
- Removal of head, oil gland, and feet
- Removal of organs (evisceration)
- Washing
- Chilling
- Cutting up, deboning, and further processing
- Packaging and labeling
- Storing (cooler or freezer)

The only time these processing activities vary significantly is when ethnic or religious slaughter is performed. Ethnic groups may require that birds be slaughtered in a particular way or minimally processed. Black-footed chickens processed Confucian style, for example, have only their feathers, toenails, and beak linings removed. Even at federally inspected plants, like Burt's Hilltop Poultry in Utica, Minnesota, when they are processing Confucian style, no evisceration, chilling, or aging is performed, in accordance with Confucian customs (JoAnne Burt, personal communication, 2004). Minimal processing can save time, but your marketing time may increase to arrange the sale.

On-Farm Processing. On-farm processing is a somewhat unique opportunity for poultry producers. Birds are relatively easy to handle (even turkeys) when compared to other livestock. Most on-farm processing is done manually. Processing volume — more than anything else — will affect labor requirements, equipment choice, facility design, and legal obligations. Two on-farm processing alternatives, manual and mobile, are well-suited for growers interested in butchering 20,000 birds or less each year and are reviewed briefly below. Use this information to begin narrowing your focus, then see **Resources** under *Processing* for more information about the alternative that seems most suitable for your operation.

Manual processing. Manual processing makes it easier to handle a wide variety of species and breeds (automated processing equipment often is designed for specific carcass sizes). This flexibility to process birds of various sizes and species is one of the major advantages of manual processing. Growers who manually process typically handle 50 to 100 birds per day on a seasonal basis (one to thirty processing days per year) (Fanatico, 2003a).

According to Andy Lee and Patricia Foreman, authors of *Day Range Poultry*, on-farm "poultry processing is easily learned, but it takes a few hundred birds to get good at it." Many producers start small—processing 200 birds or fewer each year before graduating to larger volumes. By starting small, you can get by with little expense while developing your skills. The speed at which you process will depend on your routine, number of helpers, equipment, and set-up. Most smaller, on-farm facilities process in batches, so that each processing activity is performed for all birds at once. For instance, all birds would be killed as one batch, then scalded as one batch, then plucked as one batch, etc.

Lee and Foreman recommend that novices allow at least thirty minutes to manually process and package one chicken. Someone more experienced, they say, may be able to process and package the same bird in ten minutes or six birds per hour (assuming minimal equipment and no help). When using equipment that handles at least four birds at a time, experienced processors can handle fifteen birds per person per hour (Fanatico, 2003a). There is some disagreement over how long it takes to process turkeys and other birds. The Foremans claim turkey processing takes at least three times longer than chicken processing (Lee and Foreman, 2002). But Virginia farmer Joel Salatin writes that turkey processing may be a more financially efficient use of your time, "Because the processing procedure is essentially the same for a 15-pound bird as it is for a 4-pound bird, the person hours required per pound of meat obtained are fewer for turkey than for chicken" (Salatin, 1999b). Many people in the industry agree that ducks and geese take longer than chickens *and* turkeys because ducks and geese have more feathers and down, requiring more scald time to remove. The maturity of waterfowl (that is, whether or not "pin" or immature feathers still need to grow out) has a significant impact on processing time (Metzer Farms, 2004).

Most farmers who do their own processing choose to locate these activities away from the house in a dedicated area where water is available (processing requires a lot of water to scald, wash carcasses, chill, and clean up). The site may even be outside, although a major disadvantage associated with outdoor processing is that it is seasonal. On-farm processing facilities may be as humble as a barnyard shed or a more elaborate specialized building. Many on-farm processors use renovated outbuildings, although you may choose to construct a new facility from scratch.

The type of equipment needed will depend on your processing routine and volume (a few birds daily versus a large volume of birds once a month, for example). Several poultry equipment dealers and suppliers are listed in **Resources** under *Suppliers*.

Figure 17: On-Farm Processing Supplies

• Poultry crates	• Brushes and buckets
• Killing cones	• Brooms and mops
• Scalder	• Knives
• Thermometer	• Lung puller
• Picker	• Ice
• Stainless steel eviscerating tables or shackles	• Scales
• Chill tank	• Bags, staples, and clips
• Refrigerator or freezer	• Plastic and metal mesh gloves
• Water hoses (food-grade plastic necessary)	• Hair nets, aprons, and boots
• Sanitizers	

Source: Fanatico, 2003a.

Mobile Processing. The Mobile Processing Unit (MPU) is a relatively new on-farm processing alternative. MPUs are processing plants on wheels; they are custom-built, cooperatively owned and staffed, mobile facilities that travel from farm to farm at butchering time. For farmers who do not have access to a custom processor or who can't justify their own on-farm facility, an MPU may be the answer. "An MPU is a way to start small and spread the equipment cost among a group of producers," note the authors of *Growing Your Range Poultry Business: An Entrepreneur's Toolbox*. "It offers a chance to develop the product, test market, and iron out production problems. The group can later establish a small, permanent plant" (Fanatico and Redhage, 2002).

Several MPUs have been built across the country. Some of the first were constructed in Kentucky, Nebraska, South Dakota, and New York. Most recently, 12 farmers in Michigan experimented with the MPU idea, thanks to funding from the USDA Sustainable Agriculture Research and Education program. In 1999-2000 they worked with Wagbo Peace Center (WPC) and Michigan Department of Agriculture staff to design and build a federally licensed, mobile processing plant. "We determined that it was not reasonable for every farmer to build a processing facility at their farm, and that a much more practical way to approach processing would be to have a portable unit that could be licensed and serve all the small farms in our area," says project leader and WPC Manager Rick Meisterheim (Lehnert, 2002).

The Michigan MPU took approximately 360 hours of labor to complete. The project team retrofitted a used trailer by building an interior wall to divide the scald and pluck area from the eviscerating area. They hired contractors to do the electrical, gas, and plumbing hook-ups. Fanatico estimates that a 400-bird-per-day MPU can be built for $7,000 to $12,000 (Fanatico, 2003a). The Michigan MPU, outfitted with new equipment, cost about $18,000.

In addition to financing, you'll need good organization, plus leadership and management skills in order to successfully process using a MPU. Farmers in Wisconsin, for instance, built an MPU but never really got it off the ground, says Center for Integrated Agricultural Systems' Steve Stevenson, because no one was responsible for the management and maintenance of the processing facility.

The Michigan unit has been successful because WPC coordinates all scheduling and manages fee collection. WPC and members perform maintenance, and new growers must train with a current member before using equipment. Members also trade work on processing days, helping one another. Michigan farm members "have gone above and beyond" to help out with maintenance according to WPC Program Coordinator Jennifer Lewis. "It's a very cooperative effort" (Jennifer Lewis, Wagbo Peace Center Program Coordinator, personal communication, 2004). Four years after processing their first bird, the Michigan growers now handle up to 250 chickens, turkeys, and ducks on butchering days. Rumor has it, one grower will be trying geese soon.

Off-Farm Processing. The majority of processors who offer services to farmers on a custom basis will slaughter, cut-up, bag or package, and label products. There are few custom processors and even fewer certified organic processors. If you are lucky enough to live near a custom processor, you'll still need to check into its reputation for quality, and consider your transportation, time, and expenses (also see Figure 18).

Many off-farm plants use automated equipment and consequently may not be able to process in small batches, or may have equipment sized for only one species or one type of bird (such as broilers). Call processors in your area to learn more about their services—what type of birds they process, if they will work with your own recipes, what type of inspection or certification status they hold, etc.

Figure 18: Ten Questions to Ask a Processor

Below is a sample list of questions you might ask when calling around to local processors. Not all of the questions will be relevant for your situation—choose those that apply.

1. What type of license do you hold?
2. Do you require a minimum order volume?
3. What type (species) of birds do you process?
4. Are you certified organic?
5. Do you offer ethnic slaughter?
6. How far in advance do I need to schedule processing?
7. What type of packaging do you use?
8. Will you use my labels/logo on packaging?
9. Can you process products with my recipes?
10. What are your fees?

A list of Minnesota processors can be found in the *Directory of Custom Poultry Processors in Minnesota*. Wisconsin processors are listed in the publication *Wisconsin Poultry & Egg Directory* (see **Resources** under *Processors*).

Legal Considerations

Poultry meat processing is subject to a host of regulations and oversight by federal and state agencies. Some of the regulations govern facility construction and operations, including building codes and waste management. Other regulations concern the safety and quality of products being processed. Still other rules stipulate how poultry and other meat products must be packaged and labeled. As noted by Fanatico, laws present both opportunities and limitations, particularly for on-farm processors seeking "custom exempt" status (Fanatico, 2002a). We briefly review legal considerations for permits, inspection, grading, and organic certification below (see the chapter on Poultry Marketing Alternatives for information about packaging and labeling requirements). **Always** check with your state department of agriculture for clarification.

Permits and Inspection. As a general rule, all processors — whether they operate on-farm or off-farm — must register with their state Department of Agriculture and undergo facility inspections to ensure that construction, health, and food safety codes are met. [Note: one exception is Wisconsin. If you process on-farm and sell fewer than 1,000 chickens to the public only on the farm (not at farmers' markets or other off-site locations), you are not required to obtain a license or file for exemption status (Terry Burkhardt, Meat and Poultry Inspection Bureau, Wisconsin Department of Agriculture, Trade and Consumer Protection, personal communication, 2004.)]

Inspections, however, are not always required for *birds*. That is, whenever you hear references to "state inspected" or "custom exempt" they concern the inspection and grading of birds (not the facilities). Federal and state laws are fairly clear when it comes to retail marketing: your birds must undergo "continuous" or bird-by-bird inspection conducted by state or federal employees (though exemptions exist for growers who process fewer than 1,000 birds in some states, such as Wisconsin).

When it comes to direct marketing the rules vary by state and can get a little confusing. In fact, law professor Neil Hamilton states in his book, *The Legal Guide to Direct Farm Marketing*, that "federal exemptions, especially for direct marketing of between 1,000 and 20,000 birds, are so poorly written it is hard—even for government officials—to determine exactly what they mean" (Hamilton, 1999).

Don't let this discourage you! Several excellent resources are available to help you navigate the rules. In Michigan, for instance, Richard Lehnart conducted a thorough review of processing regulations as they apply locally and compiled his findings in a publication titled *On Farm Processing of Pastured Poultry* (see **Resources** under *Processing*).

Moreover, state officials can be very helpful. According to Terry Berkhardt, with the Wisconsin Meat Poultry and Inspection Bureau, the state has new construction guidelines and remodeling recommendations on hand. Department staff are available to visit your site **before you apply for a license** and offer advice about how best to set up your processing facility so that it satisfies local codes and regulations. Staff at the Minnesota Department of Agriculture's Dairy Food and Meat Inspection Division are equally helpful.

State and federal processing regulations and questions you should ask your state inspector are outlined in Figure 19 and Figure 20. Use this information to begin formulating your own questions and then **check with your state department of agriculture** to learn more about how federal exemptions for poultry processing are being interpreted and enforced in your area.

Figure 19: Poultry Processing Inspection

FEDERAL INSPECTION

Plants with federal processing status have on-site USDA inspectors. Inspectors monitor birds as they are being processed to ensure food safety and quality. After processing, the birds can be labeled with the USDA seal of inspection. The major advantage of federal inspection is increased marketing flexibility. Birds from plants that are federally inspected can be sold to individuals at farmers' markets and to retailers anywhere in the country either through interstate commerce or the Internet. Moreover, because customers in virtually all markets are concerned with food safety they may be more likely to purchase from someone whose products are labeled as "USDA inspected."

STATE INSPECTION

Minnesota and Wisconsin operate state inspection programs (Michigan does not). In Minnesota, plants may obtain E2 or "Equal To" status meaning that they follow federal standards by requiring on-site inspection of birds antemortem and postmortem. In Minnesota and Wisconsin, products processed at state-licensed plants can be labeled with state "Inspected and Passed" language. The same advantages of processing through a federally inspected facility apply to state-inspected plants, except birds processed at state-inspected plants can be sold only in the state in which they are processed (no Internet or state-to-state sales permitted.)

Contact your state agency to learn more about inspection services, particularly if you plan to process in small batches (most states do not require minimum volume to qualify for inspection services). Lists of *state-inspected* meat and poultry processing plants are available from the Minnesota Department of Agriculture's Meat, Poultry and Egg Inspection Program and the Wisconsin Department of Agriculture's Meat and Poultry Inspection Division—Michigan does not operate a state licensing program (see **Resources** under *Agencies and Organizations* for contact information).

CUSTOM EXEMPTION

Processors who qualify for a federal and/or state exemption are small, custom processors that do not have a regular inspector on hand to conduct antemortem and postmortem inspection of the birds. So why doesn't everyone apply for a custom exempt license? There is one major disadvantage: generally you are not allowed to sell your poultry products to the public — directly or indirectly — if they have been processed at a custom exempt facility. Some states, like Wisconsin, do make exceptions and allow farmers to market a small volume (1,000 birds or fewer) of uninspected birds off-farm so long as the birds are labeled with exemption language and are minimally processed (they may be sold whole or cut-up but may not be de-boned, ground, smoked, etc.).

OTHER EXEMPTIONS

Other exemptions, such as the Small Business Enterprise exemption, religious and cultural exemptions exist. Each exemption comes with a different set of rules concerning the sale of birds. Check with your state officials to learn more.

Figure 20: Ten Questions to Ask Your State Inspector

1. What type of license do I need to process on my farm?
2. Will this license cover direct sales to consumers (e.g., at farmers' markets)?
3. Will this license cover sales to retail establishments?
4. How must my products be labeled?
5. What are filing procedures for all licenses needed?
6. Do I need to have my facilities and birds inspected?
7. Who will conduct the inspection?
8. Is the license renewable annually?
9. What are the licensing fees?
10. Is there someone that can help develop my processing plan?

Figure 21: Inspection Overview for Minnesota*

	FEDERALLY INSPECTED	STATE INSPECTED	CUSTOM EXEMPT
Facility inspected	— ✔ —	— ✔ —	— ✔ —
Birds inspected (continuous)	— ✔ —	— ✔ —	
Can de-bone, grind, smoke meat	— ✔ —	— ✔ —	
Sell on the farm	— ✔ —	— ✔ —	— ✔ —
Sell at farmers' markets	— ✔ —	— ✔ —	
Sell to retailers/wholesalers	— ✔ —	— ✔ —	
Interstate sales (sell in any state including your own)	— ✔ —		
Intrastate sales (sell in your state only)		— ✔ —	

*These may not apply in your state. **Always check with your state Department of Agriculture officials to verify inspection requirements in your state.**

Grading. Poultry meat (either whole carcasses or parts) is graded A, B, or C. The USDA has developed Quality Poultry Grade Standards for whole carcasses and parts (including boneless and skinless parts). Grades, which apply to all poultry species including chickens, turkeys, ducks, geese, guinea fowl, and pigeons, are determined by meat yield, fat covering, and appearance (or lack of defects such as skin cuts and tears, broken bones, and discoloration of meat and skin). In order for a product to be labeled as USDA Grade A, B, or C, meat must first be inspected for wholesomeness by the USDA's Food Safety and Inspection Service and individually graded by a plant grader. A sample carcass or part is then taken by a USDA grader who determines the final, official grade (Agricultural Marketing Service, USDA, www.ams.usda.gov/poultry/grading/pygrd.htm). For more information about USDA quality grading standards, see the *USDA Poultry-Grading Manual* listed in **Resources** section under *Grading*.

Organic Certification. Any facility that processes organic raw ingredients into another product (roasting, grinding, recombining, cutting, packaging, etc.) must be certified organic before products leaving the facility can be labeled as such. This means that all ingredients and processing aids (for example, filters) must conform to organic regulations and organic integrity must be maintained while in use at the processing facility. See the National Organic Program (NOP) Regulations, online at www.ams.usda.gov/nop.

Your organic certifier will require an "Organic Handling Plan" when you apply for processing certification. The Plan must describe:

- Products
- Ingredients and processing aids
- Facility set-up
- Product flow
- Waste management
- Equipment and other supplies
- Packaging materials
- Pest management

The certification process (from the time the certifier receives a completed application to the final decision) can take up to three months. Certification fees vary. For more information about organic processing certification, contact an organic certifier accredited by the USDA. You can find a list at www.ams.usda.gov/nop, or contact your state department of agriculture for information about certifiers in your area.

The complete organic standards for producing and processing livestock can be found in the National Organic Program regulations, subpart C, Sections 205.236 – 205.272.

Explore Your Alternatives

Ultimately, your decision about on-farm versus off-farm meat processing will depend primarily on: (1) customer preferences for whole carcasses versus parts; (2) processing volume; (3) proximity to local processors; (4) processing expenses; (5) financing available for equipment purchases; and (6) your desire to perform the work.

If you're still undecided about whether to process on-farm or off-farm, weigh the cost of processing services against the time and expense associated with establishing and operating your facility. See *Growing Your Range Poultry Business: An Entrepreneur's Toolbox* for a mobile processing unit budget and a small processing plant budget. Both budgets include fixed expenses associated with building the facility and variable or on-going operating expenses. You may find that processing on-farm doesn't save a whole lot of money. A survey conducted by the Center for Integrated Agricultural Systems (CIAS), for example, found that the average cost to process a bird off-farm was 20 percent higher than on-farm, and on-farm costs didn't include compensation for farmer labor (CIAS, 2003).

Finally, *don't take our word for it*. Talk with farmers who are already processing on their own, consult other publications, and visit with your local extension or state agriculture department staff to learn more about processing in your area. You may be able to acquire some hands-on experience by helping out at an on-farm processing facility (see ATTRA's *Internships and Apprentices* publication in **Resources** under *Processors*).

Background

For many people, the words "poultry production" invoke a pastoral image of hens scratching freely in a yard or on green pasture. This is the image associated with poultry production nearly fifty years ago. Over the past five decades, however, this picture of the barnyard flock has changed radically. A combination of new technologies and integration among processors, feed mills, and hatcheries has turned poultry into a large-scale commercial enterprise. Most poultry production, primarily broilers and turkeys, now takes place under contract with handful of regional companies, called integrators, in what we call "industrial" conditions — highly automated barns housing thousands of birds in confinement. Every detail of breeding, feeding, and flock productivity has been worked out to a science.

Some experienced farmers are now looking at alternatives to this industrial-style management. They are beginning to explore systems such as rotational grazing and modified pasture systems. Why? Marketing opportunities, land stewardship principles, financial objectives, and quality of life are common answers. In this chapter we describe five poultry management options: (1) Industrial; (2) Traditional; (3) Pasture: Day-range; (4) Pasture: Daily Move Pens; and (5) Organic (Pasture and Semi-confinement).

Housing, equipment, feed, health, labor, and financial requirements differ under each management alternative, and we discuss requirements in detail. When appropriate, we've included sections on legal issues and pasture management. Real-life poultry grower profiles, based on interviews with growers in Michigan, Minnesota, and Wisconsin, accompany each management system description and offer a look at how each management system (or combination of systems) works on the ground. You'll notice that no one system is "pure" — that is, growers have adapted and modified management system models to accommodate their own goals, resources, and experience.

Before you dig into the system descriptions, take a few minutes to review *Management Basics* below, particularly if you are new to poultry production. Information in this section gives you a benchmark from which to study the systems' similarities and differences, as well as their suitability for different species.

Management Basics

If you are a prospective poultry grower, you will need to become familiar with a few management basics before studying the details of a particular management system. These basics include poultry housing, equipment, supplies, flock management, and labor. Under flock management we address poultry feed, water, and health at different stages of production (brooding, laying, grow-out). Many commercial growers purchase day-old chicks or immature birds (such as pullets) from hatcheries when new birds are needed. If you are interested in raising your own replacement birds or managing breeding stock, see **Resources** under *Species/Class/Breed Information* for a list of recommended publications.

Layers in traditional housing.

There will be a lot more to managing your flock — these are just the basics. Figure 22 shows general poultry management standards for the brooding, laying, growing and finishing stages. Detailed poultry rearing publications are available such as *Storey's Guide to Raising Poultry* (see **Resources**, under *Poultry Husbandry*). Many publications apply to chicken and turkey production. For information about waterfowl or wild game species, check out *Storey's Guide to Raising Ducks* and *The Book of Geese* as well as some Extension publications listed in **Resources** under *Poultry Husbandry*.

Figure 22: Management Standards by Stage of Production

BROODING (day-old to grow-out)

Chicken hatchings, turkey poults, ducklings, goslings, and captive game brooders should be ordered and scheduled to arrive with enough time to finish them to market weight, which varies according to the final product desired. Look for breeders or hatcheries that are pullorum- and typhoid-free and flocks that have no history of sinusitis or air-sac infection. Vaccinations are often administered at the hatchery. Most brooders are reared inside, although some farmers are returning to range rearing during summer. Before the hatchlings arrive, your brooder house (where young birds are raised) should be set up with brooder rings and adequate floor space (seven to twelve square inches per chick), feed (such as a starter mash), water, litter, and a heat source. Hatchlings are stressed easily and very susceptible to drafts and dampness. Clean and disinfect the brooder house at least two weeks before brooders arrive. Cover floors with two to four inches of absorbent litter material such as wood shavings, rice hulls, or even ground corncobs. Warm the space to a temperature appropriate for your birds at least 24 hours before they arrive (heat requirements differ by species and even breed). Adjust temperatures throughout the brooding period according to supplier recommendations. Specially formulated starter rations and grit are available for chicks, turkeys, waterfowl, and game birds.

GROWING/GROW-OUT (pullets up to start of lay; meat birds from end of brooding to finishing)

During this stage of production, birds grow quickly. Birds may be housed in confinement or put on pasture to roam. Stocking rates vary by species and management practice. Adequate floor space is important to prevent overcrowding and stress. Overcrowding can lead to death loss through smothering and cannibalism. Broilers are fed a diet that produces a fast rate of gain while layers and roasters are fed on a slow rate of gain or "grower" diet. In the Midwest, turkeys are typically fed a ration of ground corn and soybean meal along with supplemental vitamins, minerals, and fat.

FINISHING (last one to two weeks before processing)

Chickens, turkeys, and other birds are typically finished in the same housing used for growers. Heavy meat birds, such as turkeys, often are fed supplemental corn or a "finishing diet" during the last two weeks before processing. At the end of the finishing stage, growers typically clean confinement facilities to remove manure and litter.

LAYING (hens aged 22+ weeks)

The typical laying cycle for hens is 13 to 15 months. Hens naturally molt (shed feathers) at about 18 to 20 months of age and begin laying again after a 4- to 8-week rest period. The most critical management factors for laying flocks are housing, light, temperature, and feed. For years, confinement style housing has been favored for layers because it keeps eggs clean and safe from predators. Because of strong marketing preferences for "free-range" products, however, some producers are returning their layers to the field and providing mobile nesting shelters. Range shelters and confinement housing must include nest boxes and roosting bars as well as an artificial light source if laying and molt cycles are to be controlled throughout winter. Feed and nutritional requirements vary by breed and size, climate, and age. Protein needs, for instance, are higher during the beginning of the birds' laying cycle when egg production is at its peak. On average, each bird requires one-quarter pound of complete feed per day, depending on housing conditions and opportunity to supplement feed rations with pasture. Poultry author Leonard Mercia describes feed requirements for brown and white egg layers by stage in his book *Storey's Guide to Raising Poultry* (see **Resources** under *Poultry Husbandry*).

Housing and infrastructure. The primary purpose of poultry housing is to protect flocks against adverse weather and predators (coyote, fox, stray dogs, raccoons, and raptors). Weather is of critical concern in the Upper Midwest, where summers can be extremely hot and winters bitterly cold. Housing must provide shade from sun and cover from rain. It must be able to withstand high winds and snow loads if it is to be used for year-round operation. These basic housing considerations apply to all poultry.

Housing designs will differ depending on species, flock size, and stage of production. See Figure 23 for a look at how floor space requirements vary by species and sex. Likewise, housing design will vary dramatically with your management philosophy, production goals, and labor availability. Some management alternatives call for permanent housing, total confinement, and the use of cages, while others rely on moveable shelters, open floors, and range. Management-specific designs generally fall into one of four categories: cage confinement, open-floor confinement, free-range, and yard-and-coop.

Figure 23: Poultry Housing Recommedations*

TYPE OF BIRD	FLOOR SPACE (SQ. FEET/BIRD	NEST BOXES (SQ. FEET/BIRD	PERCH SPACE (SQ. FEET/BIRD	MIN.TEMP (°F)	MAX.TEMP (°F)
Hens, layers	1.5	1.5	0.75	55	70
Broilers	1.5	N/A	0.75	65	70
Turkey, toms	4	N/A	N/A	65	70
Turkey, hens	3	3	N/A	65	70
Pheasants	5	3	N/A	65	70
Ducks	3	2	N/A	N/A	N/A
Geese	6	3	N/A	N/A	N/A

** These are general recommendations. Floor space and other housing requirements vary by flock size and management system.*
Source: Ekarius, 2004.

Detailed housing recommendations accompany each management system description and address floor, wall, roof, and nest box construction, as well as ventilation, insulation, heating, lighting, water, and predator control. As you read through each housing and management description, consider your own:

- Site (water and sewage, drainage, soil type, access roads)
- Climate
- Predators (land and air)
- Flock size
- Water (municipal system, private well, spring, pond)
- Neighbors
- Regulations
- Cost

Housing design and construction plans often are available free on the Internet or from your local extension office (see **Resources** under *Housing*).

Equipment and Supplies. Specialized equipment and supplies are needed for poultry production. Basic equipment such as brooder stoves or lamps, feeders, waterers, nesting boxes, and fencing are relatively inexpensive. As you read through the management descriptions, note that some of the equipment is available automated. Most automated equipment is specially designed to reduce hand labor for large flock owners. We review these options under *Industrial Management* and *Traditional Management*. If you are a small- to medium-sized flock owner, nonautomated equipment is often the most practical and economical choice. Leonard Mercia thoroughly reviews nonautomated brooders, feeders, and waterers in *Storey's Guide to Raising Poultry: Breeds, Care, Health*. We've reproduced Mercia's equipment recommendations in Figure 24.

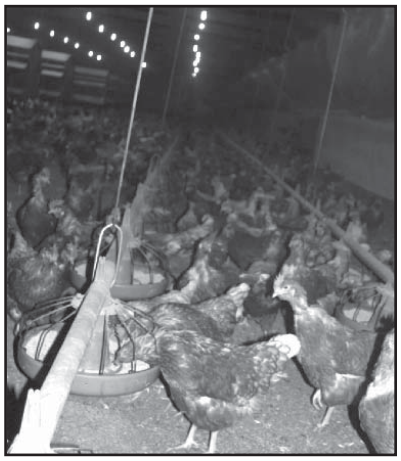
Figure 24: Equipment Requirements (per 100 Birds)

BIRD TYPE	AGE (WKS)	BROODERS		FEEDERS	WATERERS
		HOVER TYPE	INFRARED LAMP		
Chicken (broilers, roasters, capons, and pullets)	0-2	700 sq. inches	2	1 feeder lit to 7 days 100 inches of trough or 3 hanging	20 inches trough or 2 one-gal.
	2-6	700 sq. inches	2	200 inches of trough or 3 hanging	40 inches trough or 3 one-gal.
	6-maturity	———	———	300 inches of trough or 4 hanging	96 inches of trough or 1 automatic
Chicken (layer)	22-market	———	———	300 inches of trough or 4 hanging	96 inches of trough or 1 automatic
Turkey	0-2	1200 sq. inches	2-3	1 feeder lit to 7 days, 200 inches of trough or 3 hanging	20 inches trough or 2 one-gal.
	2-6	1200 sq. inches	2-3	400 inches of trough or 5 hanging	96 inches trough or 1 automatic
	6-market	———	———	480 inches of trough or 6 hanging	120 inches trough or 1 automatic
Waterfowl, duck and goose	0-2	1200 sq. inches	2-3	1 feeder lit to 7 days 100 inches of trough or 3 hanging	20 inches trough or 2 one-gal.
	2-4	1200 sq. inches	2-3	200 inches of trough or 3 hanging	50 inches trough or 3 automatic
	4-market	———	———	200 inches of trough or 5 hanging	50 inches trough or 3 automatic

Source: Mercia, 2001.

Also note that while most poultry equipment (such as brooder stoves) can be used for a range of species, you may have to make some adjustments depending on the birds you raise. Commercial waterfowl growers, for instance, brood their young birds in much the same way as chicken growers—using electric and gas brooders. But they adjust the brooder height to accommodate the larger birds, and provide more "hover space." (Geiger and Biellier, 1993a). Most equipment manufacturers can help you determine what is right for your flock. Moreover, some supplies such as incubators and egg trays are available by species (see **Resources** under *Suppliers* for a list of new and used equipment suppliers).

Feed. Poultry require fresh water and nutritionally balanced feed. Grit is also necessary if you feed whole grains or pasture your birds. Poultry digestion is highly dependent on water, which softens food in the gizzard. Consequently, birds' water intake is almost double the volume of food intake. Diets that lack adequate water and nutrition can slow growth, reduce egg and eggshell quality, limit feed efficiency, and inhibit a flock's immune system.


Layers at feeders.

The nutritional needs of poultry are complex and vary with the species, breed, age, and sex (Damron and Sloan, 1998). Nutritional needs also vary with management practice. Many of today's poultry producers use "complete" feeds. These are grain-based, species-specific feeds that contain all the nutrients necessary in the poultry diet (proteins, carbohydrates, fats, vitamins, and minerals). Commercial, premixed complete feeds are usually labeled for rate of gain or stage of production. Hatchlings, for instance, usually are fed a "starter" ration that contains the highest level protein that birds receive in a lifetime. Once birds begin to mature, they are switched over to "grower," "finisher," or "layer" diets depending on the birds' age and ultimate use.

Almost all starter, developer, and finisher diets are available "medicated," "nonmedicated," "natural," and "organic." Low-level antibiotics and coccidiostats are added to medicated feed to prevent common poultry diseases for all birds with the exception of waterfowl. Dr. Jacqueline Jacob, University of Minnesota Extension poultry specialist, warns that waterfowl should never be fed medicated feed, as antibiotics can cause lameness and/or death in this species. The "natural" label typically means that antibiotics have not been added, while "organic" ensures that the feed has been grown and certified without the use of synthetic chemicals and that it does not contain animal by-products.

Most complete feeds are available from a local supplier or feed mill. If you are lucky enough to live near a mill, bulk feed is usually discounted and sometimes delivered. If you are having trouble locating feed or have questions regarding its contents and recommended feeding schedule, see **Resources** under *Feed and Diet* and *Suppliers*. If you prefer to mix your own feed or supplement with pasturage, consult with an extension poultry specialist or refer to one of the many publications on poultry nutrition listed in **Resources** under *Feed and Diet*. Of special interest is an article from the Manitoba Department of Agriculture and Food titled *Increasing Omega-3 Fatty Acids in Eggs from Small Chicken Flocks*. If your market research suggests your buyers are willing to pay more for Omega-3 enriched eggs, you'll want to explore feed and management alternatives that aid in Omega-3 fatty acid production.

Health and Welfare. Flock health and welfare are critical management issues. Health is fairly straightforward and depends on how well you are able to control both infectious and noninfectious diseases. Welfare is another matter and concerns the well-being of your flock. In livestock housing author Carol Ekarius' words, welfare is violated when birds are abused or neglected and/or bored and confined to restrictive environments (Ekarius, 2004). A number of poultry growers, among them Michigan growers Frank and Kay Jones, argue that birds' welfare or well-being depends on their ability to practice natural behaviors such as scratching (see Farm Profile: Day-range—Earth Shine Farm).

Some animal welfare advocates feel that industrial management practices, including confinement housing, beak and toe trimming, and artificial lighting, are unacceptable (Robinson, 2004). Still others argue that allowing birds outside exposes them to disease and parasites as well as predators. Welfare concerns are addressed independently alongside each management alternative in the following sections. Health management basics are reviewed below.

Infectious disease comes from bacteria, viruses, fungi, and parasites. Noninfectious disease is the result of nutritional problems (either a deficiency or excess), chemical poisons, injury, or excessive stress. Gail Damerow, author of *The Chicken Health Handbook*, explains that "diseases are introduced from reservoirs of infection, defined as any source or site where a disease-causing organism survives or multiplies and from which it can be transferred to a host."

Damerow's list of disease reservoirs include chickens and other domestic poultry, exotic and caged birds, wild birds, wild animals (including rodents), livestock, household pets, humans, earthworms, snails, slugs, arthropods (fleas, mites, ticks, lice, mosquitoes, sow bugs, crickets, and grasshoppers eaten by your birds), feed containing fungi, stagnant water, litter, soil, dust, and poorly sanitized equipment such as incubators, crates, and brooders. In addition, Damerow warns that environmental factors such as cold and heat can lead to frostbite on wattles and combs, stress, and even cannibalism among chickens and turkeys (waterfowl are "completely clothed" meaning that they do not have exposed wattles and combs) (Damerow, 1994).

Disease can be spread directly from hen to embryo or from one bird to another as well as indirectly by something that can transport the disease (like the bottom of your boot). Poultry growers limit the introduction of disease through what are called "biosecurity" measures. Biosecurity includes the use of:

- Disease resistant breeds
- Regular sanitation
- Housing to keep out wild animals
- Closed flocks
- Visitation limits
- Planned labor movements (caring for younger, more susceptible birds first before moving to older birds)
- Flock history records

Management alternatives, species, and flock size will, in part, determine which biosecurity practices you utilize. Some management alternatives, for example, organic management, preclude the use of medicated feed and beak trimming, and emphasize access to fresh air and sunshine to break up disease cycles. Moreover, species choice dramatically affects the need to introduce biosecurity measures. Ducks and geese, for instance, are considered much more disease resistant than chickens. In fact, waterfowl growers typically do not vaccinate or employ what have become routine biosecurity practices on broiler and turkey farms. "Even when kept under less than ideal conditions," says Holderread, "small duck flocks are seldom bothered by sickness or parasites" (Holderread, 2001).

In addition to biosecurity measures, growers often promote flock health through the use of vaccines, medicated feed, beak trimming, and healthy chicks. Poultry specialists recommend purchasing day-old chicks and pullets from hatcheries that participate in the National Poultry Improvement Plan. These hatcheries blood test their flocks to check for common diseases. For a list of hatcheries participating in the National Poultry Improvement Plan, contact the USDA APHIS (see **Resources** under *Hatcheries* for contact information) (Mercia, 2001).

As you read through the management alternatives, think about what combination of biosecurity measures and health promotion practices might work best for you.

It is important that you report suspected disease problems in your flock. Prompt disease reporting helps to limit the spread of disease. If your birds show signs of illness, contact your veterinarian or your state Board or Division of Animal Health.

Michigan Department of Agriculture, Animal Industry Division. 525 West Alegan, P.O. Box 30017, Lansing, MI 48909. (517) 373-1077. www.michigan.gov/mda/0,1607,7-125-1568_2390_25486---,00.html

Minnesota Board of Animal Health. 625 Robert Street North, St. Paul, MN 55155. (651) 296-2942 or 800-627-3529 (TTY). www.bah.state.mn.us/animals/poultry/poultry.html

Wisconsin Department of Agriculture, Trade and Consumer Protection Division of Animal Health. P.O. Box 8911, Madison, WI 53708-8911. (608) 224-4872. www.datcp.state.wi.us/ah/agriculture/animals/disease/reporting-disease/index.jsp

Labor. Experienced producers will tell you that poultry, like other livestock, must be tended seven days a week. However, this doesn't mean seven *full* days. Expect to spend some time (one to six hours) every day on basic production management tasks such as feeding, watering, observation, recordkeeping, and sanitation.

Your tasks and actual hours will vary with species, flock size, production objectives (egg production versus meat production), season, and with the management alternative you choose. Some alternatives, for example, the industrial system, make use of automated equipment to reduce labor required to feed the flock or collect eggs. At the same time, automated equipment may increase the number of hours you spend maintaining machinery. There are labor trade-offs with every management alternative.

Daily chores and seasonal maintenance requirements are reviewed in the labor summary for each management alternative. We've included labor estimates from other growers when available to give you a feel for how much time and skill it may take to run your poultry enterprise under each management alternative.

Finances. Finances are critical to any business. Poultry is no different. You will need to consider:

- Capital investments
- Credit availability
- Fixed costs
- Variable costs
- Cash flow
- Income
- Net worth change

We briefly review these financial considerations for each management system. Generally, however, income and expense estimates are not reported. While some figures do exist, they come from a range of sources and therefore are not comparable. Instead, we reference the sources and encourage you to put together your own budget numbers using the *Generic Poultry Enterprise Budget* developed by the Center for Integrated Agricultural Systems (CIAS). See www.wisc.edu/cias for a sample budget that includes fixed and variable expense estimates. Use these figures as a guide only. Your situation will be unique as will be your management preferences, resources, and, consequently, your budget.

A WORD ABOUT AVIAN INFLUENZA, OR "BIRD FLU"

When we began interviewing producers for this poultry publication in 2003, bird flu was something only a few people had heard about. As we went to press in the fall of 2005, Avian Influenza (AI), or "Bird Flu", was suddenly getting a lot of media coverage, and while some warned of an impending bird flu pandemic, others dismissed some of the warnings as exaggerated. Equally controversial were warnings that birds pastured, outdoors would contract the disease and spread it throughout the poultry industry, countered by claims that birds reared in close quarter indoors were less robust and more susceptible to the virus. Since that time, several resources about avian influenza have been developed to provide information to poultry farmers. We briefly highlight some of the issues, and suggest you check out the listed resources for more information.

The reality is that understanding and tracking avian influenza viruses is a complex task. The influenza family of viruses is classified into types and subtypes. Even within those subtypes, the influenza viruses are classified as low pathogenicity or high pathogenicity, based on their ability to cause disease in chickens infected with the virus. The H5N1 virus causing problems overseas is highly pathogenic—it causes fatal disease in many of the infected birds. Not all H5N1 viruses, however, are highly pathogenic and there have been incidences of low pathogenic H5N1 worldwide. The influenza virus, however, is very prone to mutations, allowing the conversion from low pathogenic to high pathogenic. To date this conversion to the highly pathogenic form has only occurred with H5 and H7 serotypes.

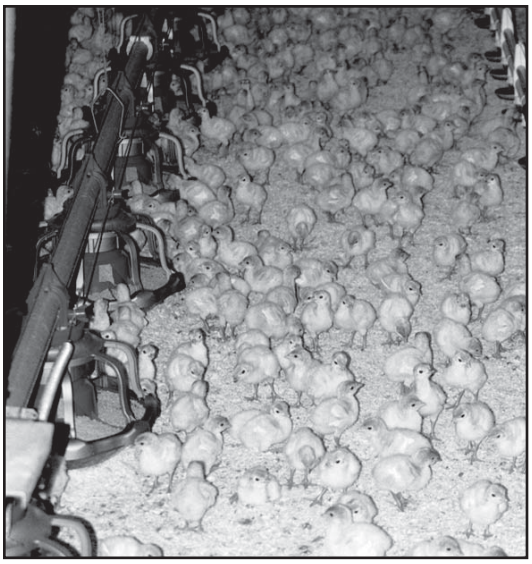
Possible entry points of the highly pathogenic H5N1 virus to North America are being closely monitored. Migratory bird populations are being watched in Alaska, where wild birds migrating north from Asian and European countries may mingle with wild birds migrating north from the United States and Canada. One of the biggest concerns is smuggling of infected wild birds into the U.S. The United States has a program that regularly tracks other subtypes of avian influenza that are already circulating here. According to the Centers for Disease Control, "In the United States, from 1997 to 2005, there were 16 outbreaks of low pathogenic avian influenza viruses (H5 and H7 subtype) and one outbreak of highly pathogenic avian influenza (H5N2) in poultry."

What does this mean for small flock poultry production, pastured poultry, or other forms of outdoor rearing? If H5N1 is found in U.S. migratory birds, poultry production may be ordered indoors, at least temporarily, in the area where infected wild birds were found. If H5N1 is found in a poultry flock, regardless of the size of the flock or the production method used, the area will be quarantined. Any birds not already dead from the virus will be killed. This is the standard procedure followed with other types of H5 and H7 avian influenza outbreaks as well, to quickly stamp out the spread of the disease. Farmers are compensated for their killed birds, and can return to poultry production after the disease threat has passed.

For many larger poultry flocks reared indoors, strict biosecurity measures are already in place, and it will be critical to follow those procedures to avoid spreading the disease between buildings. There are biosecurity measures that small flock owners should take to minimize the risk of exposing their flocks to any type of avian flu or other diseases. An important precaution for poultry raised outdoors is to make sure that feed is not a beacon that attracts passing waterfowl. This can be accomplished by feeding under cover. See the following for more information, as well as the "Health and Welfare" section on page 41.

Avian Influenza in Free-Range and Organic Poultry Production. 2006. Anne Fanatico. Available from: ATTRA, P.O. Box 3657, Fayetteville, AR 72702. 800-346-9140 (English), 800-411-3222 (Español). In full text online at: www.attra.org/avian.html

Overview of Avian Influenza. Dr. Dave Halvorson. College of Veterinary Medicine, University of Minnesota. www.cvm.umn.edu/ai/home.html



Turkey chicks in brooder house.

Industrial Management: Confinement

The industrial management alternative is familiar to most growers because it originated in the poultry sector. During the 1920s synthetic Vitamin D was developed. This scientific achievement allowed growers to bring their birds inside. Layer hens were the first to be raised in total confinement as commercial markets for broiler meat had not yet evolved (Kennard, 1951). By the 1950s, however, markets for chicken meat had grown to the point where large-scale, indoor broiler production made economic sense (Fanatico, 2002a). Today, nearly 100 percent of all broiler production in the United States takes place on farms that use industrial management practices. This management alternative is characterized by:

- Large flocks (20,000 – 1,500,000 birds per farm)
- Confinement housing
- Automated equipment
- Marketing contracts
- Substantial capital investments

Birds are raised inside barns year-round. Many of the daily tasks such as feeding, watering, and egg collection are automated through the use of specialized equipment. However, there is a price for this labor-saving technology. Industrial-style barns and equipment are expensive compared to the alternatives. Large capital outlays and financing are typical. And, because of the large volume of birds required to make these capital investments worthwhile, most industrial production and promotion takes place under contract with regional or national companies. These companies, called integrators, conduct all of the product marketing and pay growers a prearranged contract price to manage hatching eggs, broilers, turkeys, and laying hens.

Contract terms differ by species. For instance, the majority of industrial turkey production takes place on farms where growers manage their birds independently and purchase poults, feed, and other inputs on their own. These growers sign contracts in advance of production. Contracts often stipulate a live-weight price. By contrast, almost 100 percent of broiler production is managed under "grow-out" contracts where farmers own their barns and equipment independently, but are legally obliged to use birds, feed, and other inputs supplied by the integrator. Contract broiler producers are also required to work regularly with a company-paid service person who is assigned by the integrator to make many flock management decisions (Jacquie Jacob, University of Minnesota poultry extension specialist, personal communication, 2004). Consequently, broiler grow-out contracts have been likened to service contracts where the farmer supplies day-to-day labor (services). Hatching egg contracts are similar to broiler contracts in that integrators supply the majority of inputs, including pullets (birds that are ready to lay). Like the broiler producers, hatching egg growers are responsible for financing the land, housing, equipment, utilities, labor, and litter (Cunningham, 2002a).

According to University of Minnesota Extension poultry scientist Jacquie Jacob, the majority of table egg production in Minnesota, Michigan, and Wisconsin takes place in facilities owned by large companies rather than by independent growers. In this case, companies control all aspects of production and hire employees to perform daily tasks. In some cases, these companies may purchase table eggs from independent growers if they are short on supply or if they are in the market for specialty eggs (such as organic or cage-free eggs). Specialty eggs are typically produced under contract and sold under the company's label. These types of arrangements may grow in the future. But for now, the overall volume of table eggs raised under contract by independent growers is relatively small. For this reason, the industrial management description that follows focuses on contract broiler and turkey meat production.

INDUSTRIAL: CONFINEMENT

Industrial Management Overview

Birds:	Cornish Cross broiler chickens, Broad Breasted White turkeys
Land:	Level area for housing with access to acreage for manure and litter disposal
Buildings:	Newly constructed, highly specialized barns
Stocking density:	0.8 – 1.0 square feet per broiler to 3 square feet/tom turkey
Equipment:	Automated feeders, waterers, ventilation, heating, and lighting
Labor:	Full-time or part-time
Operation:	Year-round
Finances:	Large capital investments, low return on equity, predictable annual income
Advantages:	Raise large number of birds on small land base, shared market price risk, year-round cash flow
Disadvantages:	Large capital investments, no marketing flexibility, need for continual equipment/technology investments, relatively low return on assets, little or no salvage value for equipment, poor air quality

The industrial management alternative may be a good option if you: enjoy managing "by the book"; seek a more predictable annual income; prefer to have someone else handle marketing; have access to financing; and live near integrator facilities.

Birds and Performance. Turkeys and chickens are the two birds most commonly raised in the United States in volume under confinement conditions. As mentioned, the majority of contract turkey growers are completely independent from integrators when it comes to breed selection and other flock management decisions. Large-scale, commercial turkey growers almost always use the Broad Breasted White. The Broad Breasted White has become most favored thanks to its excellent growth rates and light colored (more marketable) meat. Broad Breasted White hens can be expected to reach 18 to 20 pounds at 15 weeks, while the toms will reach 27 to 29 pounds by the same age (Mercia, 2001).

As a contract broiler or hatching egg producer you won't have any say when it comes to breed selection. Integrators, who have invested a great deal of research and development money in bird genetics and breeding stock, supply day-old broiler chicks and hatching egg pullets, and almost always use the Cornish Cross chicken for broilers. This breed has been genetically selected for confinement production, rapid growth, and uniform carcass size. Broilers typically reach their market weight in 49 to 56 days, when they weigh six pounds or more. Feed efficiency ratios of 1.60 to 1.87 pounds per pound of feed during the grow-out period are typical, according to a commercial breeding source (Arbor Acres, 2004).

Housing. Contract broiler farms can range in size from 25,000 birds per year to 125,000 birds per year. Commercial turkey producers, on the other hand, typically raise 45,000 turkeys per year (three flocks of about 15,000 birds each) (Minnesota Turkey Research and Promotion Council and the Minnesota Turkey Growers Association, 2004). This housing system is what NCAT poultry specialist Anne Fanatico calls "high density." Houses are built to allow one square foot per bird for broilers and a maximum of 3.5 square feet per bird for tom turkeys.

Site location should be your first housing consideration. Ideally, poultry house(s) are located near the farmstead on a site where there is good soil drainage, air movement, and access to a water supply. These site conditions will help ensure that your flock is safe, healthy, and productive, and will make your maintenance work easier. It is also important to consider siting the poultry house to minimize negative impacts on your neighbors.

Specific building designs vary by bird species, stage of production, climate, and by integrator. "Each integrator will have specific building design, equipment specifications, and location requirements," note Oklahoma State University Extension specialists (Doye, et.al., 1996). Plans for industrial housing requirements are available from USDA, North Dakota State University, and Colorado State University (see **Resources** under *Housing*).

Brooder houses. Most contract broiler growers are expected to brood and rear their birds. The same barn is used for brooding and grow-out of broiler chickens, since the short grow-out period does not justify the use of separate facilities. An average flock of between 20,000 to 25,000 birds is typically housed in a 16,000 to 20,000 square foot barn. The chicks are usually brooded in small "rings" and given access to the entire house after two to three weeks of age. An all-in-all-out biosecurity system is used.


Turkey chicks in brooder house on Bussis Farm.

Turkeys are almost always sexed. Males and females are brooded separately and grown-out separately. This method is more practical with the longer grow-out period. To minimize health risks, brooders are reared and housed separately from the more mature grow-out birds (young birds are susceptible to pathogens carried by older birds). Housing construction is similar for both brooding and grow-out. Industrial houses or barns are usually built new on hard ground or cement pads, insulated, and equipped with automated feeding, lighting, and ventilation systems.

Houses may contain windows and must be well insulated to help regulate indoor temperatures throughout the year. Automated and natural ventilation systems also aid in climate control. Many turkey growers provide natural ventilation through the use of curtains that can be raised and lowered to allow in fresh air (see Farm Profile: How Cooperation Saved Turkey Farms from Death by Dis-integration). End curtains or doors must be wide enough to accommodate a skid steer loader or tractor for litter removal. Broiler houses tend to use more mechanical ventilation, often tunnel ventilation, and are thus more likely to be windowless. The house floor is always covered with a litter; in the Midwest this is usually wood shavings. Birds are allowed to move around freely in the barn (cages are used only for laying hens).

Turkey poults are always raised in houses that are separate from adult bird houses. One resource suggests constructing brooder barns a minimum of one-half to one mile away from the adult grow-out barns to minimize health risks (see Health and Welfare below). Inside the brooder houses, poults are placed in brooder rings with stoves for the first week and closely monitored. For the remainder of the brooding phase (one to six weeks), these young birds are given approximately one to one-and-a-half square feet each of floor space. They may continue to need supplemental heat, depending on the time of year and your building's climate control system. Once birds are past the brooder stage, they are moved to grow-out houses.

Grow-out houses. Stocking rates and equipment are typically the only things that distinguish industrial-style brooder turkey houses from turkey grow-out houses. The basic structure is the same and utilizes a combination of unrestricted natural and artificial lighting; windows and natural ventilation to control moisture, dust, and temperature; and litter.

Hens and toms are raised in separate grow-out houses to accommodate their different growth rates and feed needs. During the grow-out phase, toms require a minimum of 3.5 square feet per bird while hens need a little less: 2.5 square feet per bird. This means that a 25,000 square foot house will accommodate 7,000 toms and 10,000 turkey hens.

Feed and Water. Birds raised in confinement are fed very specialized diets to meet nutritional needs throughout different growth and production stages. Complete feeds are nutritionally balanced to promote bird health, growth, and production for the least cost (least-cost diets). They may contain grain, livestock byproducts (such as meat and bone meal or feathermeal), and medication (Fanatico, 2002a). The integrator with which you contract will provide a complete feed for your birds. You may use between four and eight different diets, depending on your contractor's feed regimen, to take your birds from the brooder stage to slaughter (California Poultry Workgroup, 1998).

Feeding is done entirely indoors with the help of equipment. Feeders are activated by a time clock to ensure fresh feed is available for broilers, turkeys, and layers. In most cases birds are given continuous access to feed and water (called "free choice" or "*ad libitim*"). More recently, however, some commercial broiler and breeder operations have begun turning to a restricted feed routine to reduce late-term mortality associated with heart failure. When feed is restricted to eight hours for broilers during days 7 to 28, there is a significant reduction of ascites (fluid in the heart cavity) and late-term mortality (heart attack) rates (Mattocks, 2002).

Equipment and Supplies. Industrial equipment is almost always automated and designed for very specific tasks. The most common equipment and supplies needed include:

- Brooder stoves
- Automatic feeders and waterers
- Nipple drinkers
- Misters
- Fans
- Bulk feed storage bins
- Pan-type feeders
- Front-end loader for clean out
- High-pressure sprayer for cleaning
- Hoses and brushes
- Disinfectants
- Manure spreader
- Truck with trailer

Integrators will help you determine what equipment is needed and where to find it at the lowest cost. Most likely, you will be purchasing equipment new since technological improvements occur so frequently that used equipment is quickly considered inefficient. Specified equipment is purchased by the producer.

Health and Welfare. Flock mortality averages five percent for broilers and between ten to twelve percent for turkeys on industrially managed farms (National Chicken Council, 2002). Growers who employ industrial practices maintain health and welfare from a biosecurity approach. Industrial-style managers use the following preventive measures to limit disease, bird injury, and mortalities:

- Biosecurity precautions
- Sanitation
- Vaccination
- Beak trimming for turkeys
- Staff training

Biosecurity precautions. Routine biosecurity measures include: limiting visitors; providing foot-baths, showers, and protective clothing; restricting workers' contact with other poultry; controlling rodents and wild birds; and confining pets away from production barns (California Poultry Workgroup, 1998). Sanitation measures involve the complete cleaning and disinfecting of housing and equipment in between flocks.

Another biosecurity issue is air quality—both inside and outside the barn. Litter moisture must be maintained at the proper level to prevent the buildup of dust and ammonia, which can be fatal to the birds. During the winter, this can be a challenge—managers must carefully balance ventilation and fresh air with the need to retain heat in the buildings.

Vaccination and beak trimming. Vaccination is a common preventive measure performed at the hatchery for both broilers and turkeys. Follow-up vaccines depend on which diseases, if any, are prevalent in the area. Beak trimming is another common preventive measure performed at the hatchery for turkeys.

Staff training. Training is essential for anyone involved in poultry management. Bird injuries and stress occur when they are improperly handled or when environmental conditions are ignored. Broilers, for example, bruise when improperly handled (catching and containing birds). Proper training, combined with catching in the dark, can help prevent bruising. The California Poultry Workgroup, in its publication *Turkey Care Practices*, notes that the development of a positive attitude is the most important part of training (1998). Moreover, your assigned service person should help you learn the skills needed to regulate barn temperatures, air flow, and humidity. When moisture levels are too high, for instance, ammonia develops in the litter pack. High concentrations in the air can cause breast blisters on turkeys or even death from respiratory failure.

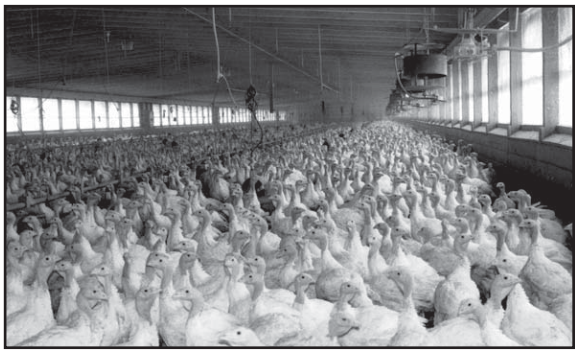
All poultry operations must deal with dead birds, which must be removed and recorded each day. Dead birds may be buried, incinerated, rendered, or composted. There are pros and cons to each. Check with your local zoning and planning commission to learn about regulations.

Labor. Integrators market contract broiler production as a part-time job. Many growers disagree. A 1999 survey of more than 1,400 contract broiler producers in ten states suggests that industrial production is more than a part-time job. However, the number of hours worked depends on the number of broilers produced each year and on the stage of production. On average, growers with two to four houses (total average of 394,000 birds per year) reported spending 7.4 hours per day during the brooding period (two weeks after chick delivery) (Schrader and Wilson, 2001). Daily labor requirements dropped to 5.5 hours per day in the weeks that followed. Additionally, routine and major cleanouts absorbed a total of 33.3 and 43.3 hours, respectively, and were performed with the help of some hired labor. Similarly, hatching egg production is a full-time job requiring six to eight hours of work each day, seven days per week (Cunningham, 2002b).

So, where do the hours go? Regular tasks associated with industrial-style management involve: flock management; catching and moving birds; building and equipment maintenance; recordkeeping; cleaning out and sanitizing housing and equipment; and communicating with a service person.

Catching and moving birds. Catching and moving birds require some skill, and is one of the most difficult tasks producers must perform (California Poultry Workgroup, 1998). Broilers must be caught and moved to crates by hand. Full-grown turkeys are moved by walking them from the grow-out barn onto trailers. These are large, temperamental birds that are injured easily if improperly handled.

Maintenance. Housing and equipment maintenance is an on-going job, even when equipment is fairly new. Preventive maintenance on ventilation and feeding equipment is essential and must be done routinely. Growers are encouraged to do maintenance and repair work themselves, since hiring this type of work can be expensive and can substantially increase operation costs (Cunningham, 2002b).



Nearly fully grown turkeys on the Bussis farm. At this stage, Joel can move slowly among the birds to monitor their condition.

Clean-out. Once your birds are headed to the grow-out house or processor, clean-out must begin. Growers are responsible for cleaning out, washing, and disinfecting barns as well as disposing of manure and litter after each batch of birds has been removed. Manure and litter packs are often removed with a skid steer loader or other equipment and hauled off-site for biosecurity reasons. Broilers deposit four pounds of litter per bird over an eight-week period (Mercia, 2001).

In many areas of the country, manure and litter disposal (waste management) has become a contentious issue, since contracted farms are concentrated geographically (to be close to processing and feed plants). As noted by USDA staff, "In some parts of the country, animal wastes pose no environmental threat, but in other, more environmentally sensitive areas, the high concentration of animal wastes has resulted in nitrogen and phosphates leaching into groundwater or washing into streams, causing water quality problems and environmental degradation" (Ollinger, et al., 2000). The issue has become so contentious that many integrators now require their growers to present a plan for manure and litter disposal. In the Upper Midwest, most farmers have adequate access to cropland for waste disposal, and because the manure is mixed with litter, it can be applied directly to fields (Fanatico, 2002a).

Communication. Contract growers receive technical assistance from a service person who is assigned to the farm by the integrator. This service person may visit the farm daily during start-up (especially with new growers) and weekly once production is underway. The service person helps with flock management, proper ventilation, litter, pest control, and disposal of dead birds (Doye, et al., 1996). He or she can visit your farm unannounced any time in accordance with most contracts. The majority of contract broiler growers surveyed in 1999 reported having a good relationship with their assigned service person. In fact, the majority of survey respondents said that "the service person always or usually takes the time to help the grower understand and follow [company] recommendations" (Schrader and Wilson, 2001). Additionally, some integrators provide "growing guides" to help with broiler management basics. Once familiar with new equipment, most farmers find their daily tasks fairly straightforward.

Finances. Industrial contract production has the appealing financial advantages of shared price risk and guaranteed income. On the flip side, however, substantial capital investments are required. Farmers, lenders, and lawyers alike have raised questions concerning the financial prudence of signing broiler production contracts. Careful budgeting and evaluation are necessary before entering into contract production. Consider the following:

- Capital required to build and equip poultry houses
- Availability of financing
- Contract payment formulas and conditions
- Equity and expected return on investment
- Cash flow and income during debt pay-down period

Contract growers are usually paid a base price per pound of "useable" bird. In Minnesota, one company's base price recently amounted to one-fifth the retail price per pound for fresh, whole chicken. In addition to this base price, growers may earn bonuses or incur discounts for above average or below average performance, respectively. As a general rule, bonuses are paid for above average feed efficiency (more pounds of chicken produced per pound of feed). Some other companies give discounts for poor feed efficiency and above average mortalities (Doye, et al., 1996). Contract terms vary by integrator.

In a ten-state survey, some growers reported earning income that was equal to or greater than what they expected, but the majority of growers generated less income than expected from their contracted broiler operations (Schrader and Wilson, 2001). Many contract broiler growers reported struggling with negative cash flow while capital loans (for housing and equipment) were being paid off. Under most contracts, growers are expected to put up a minimum of two houses (to reduce input expenses associated with transport). It is not uncommon, however, for a grower to construct four or five barns that each cost over $100,000. According to the University of Georgia Cooperative Extension Service, these capital investments—if well maintained—have a physical life of 30 years or more. A long physical life, however, doesn't necessarily translate into real equity. Some critics of the industrial management system note that the specialized buildings and equipment require constant equipment upgrades to remain competitive and have limited market or salvage value (Taylor, 2002).

If you are considering industrial management, make phone calls to identify local capital costs and input expenses, in order to develop realistic enterprise budgets, projected income statements, and projected cash flows. Talk to your prospective integrator and other growers to learn more about required capital investments and your potential returns.

Legal Considerations. Drake University Law professor Neil Hamilton examined broiler contracts offered by 18 different companies. He found that the contracts generally fell within one of two categories: "standard" contracts and "grower friendly" contracts. The grower friendly contracts generally included terms similar to the standard contract with the addition of provisions "that appear to provide some level of protection or assurance to growers" (Hamilton, 2001). Standard and grower-friendly broiler contract terms are summarized in Figure 25. If you are considering contract production, compare these terms with those offered by the contracting company in your area. When considering contract production for broilers, turkeys, or other poultry enterprises, be sure to consult with a lawyer who is familiar with the industry. Farmers' Legal Action Group, located in Minnesota, may be able to help you identify an appropriate lawyer. Moreover, you may want to contact the National Contract Poultry Growers' Association or an experienced farmer to review your contract terms *before* you sign.

Figure 25: General Broiler Production Contract Terms

STANDARD CONTRACT TERMS	GROWER-FRIENDLY CONTRACT TERMS
■ Duties of the company ■ Duties of the grower ■ The grower's independent status ■ Incorporation of an attached payment schedule subject to change by the company ■ Term or length of the contract ■ Timing, frequency, and number of flocks at company's discretion ■ Timing of removal and processing of birds at company's discretion ■ Grower to be present or represented during catching or accept risk ■ Title to the birds with the company and prohibition on grower liens ■ Prohibition against keeping other fowl on the grower's property ■ Prohibition against using supplies not provided by company ■ Company's right of access to the grower's facility ■ Company's right to take over the grower's facility or remove the birds ■ Grower actions considered by company to be a default of the contract ■ Only written contract terms applicable with no modification unless in writing ■ Assignment of contract only with approval of the company	■ Right to join any organization or association ■ Prompt weighing of live birds ■ Chick placement from hatchery is random ■ Payment possible if birds die due to Act of God ■ Grower can view feed weighing and live bird weighing ■ Company agrees to use certified scales for weighing ■ Delivery of weigh tickets and records ■ Assistance program for growers with poor performance ■ Incorporation of a written "Broiler Growing Guide" establishing standards ■ Company employees excluded from the payment pool

Source: Excerpted from Hamilton, 2001.

Summary. Industrial production may be an excellent alternative for someone who would like to produce year-round, has access to capital, and is not interested in marketing independently. Be aware, however, that most integrators have waiting lists. If you are interested in industrial, contract production, contact an integrator in your area to learn about contracting opportunities and to request a copy of a sample grower contract. Poultry growers who contract with integrators say the most important thing you can do before signing a contract is to read it!

- Know your commitments (and those of the processors).
- Ask questions.
- Talk with other producers who have signed contracts with the same processor.
- Review the contract with a lender and a lawyer.

An excellent resource to assist with contract evaluation is Oklahoma Cooperative Extension Service's *Broiler Production: Considerations for Potential Growers.* Although this publication is aimed at Oklahoma producers, he information and advice apply to Midwestern producers (see **Resources** under *Legal Considerations*).

Joel Bussis, Trestle Town Turkeys
Hamilton, Michigan

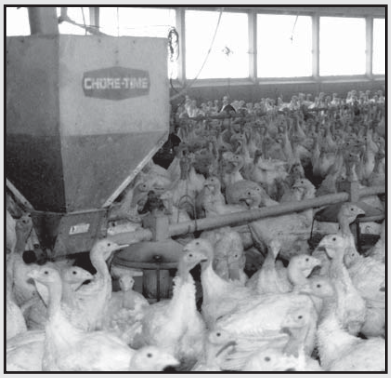
How Cooperation Saved Turkey Farms from Death by Dis-integration

Joel Bussis

In most large poultry operations, farmer-producers are "integrated" into larger systems in which most management decisions are made by others. Those in charge, the integrators, might be feed or equipment supply companies, processing companies, or marketing companies. For 10 years, John and Joel Bussis were part of a system like that, growing turkeys for Bil-Mar Foods, a division of Sara Lee. John and Joel owned the buildings and provided the labor, and they could earn bonuses if the birds performed well. But the kind of birds they fed, when and what they fed them, and what they would be paid for them were all part of the contract written by Bil-Mar. In 1997, Bil-Mar management decided the real money in the turkey business lay in *marketing* a brand name product—not in its actual *production* or *processing*. They told their growers there would be no future production contracts, that existing contracts would be terminated at the end of 1999 and growers paid off, and that turkey processing operations in Zeeland, Michigan, would be phased down in 1998 and ended the next year.

The Bil-Mar decision to "dis-integrate" gave real meaning to the word, for it left the growers disconnected, without a market, and without the coordinating services Bil-Mar provided along with the market. The Bussises suddenly faced the extinction of their farm. They owned only 58 acres, more than half of it devoted to specialized buildings and a manure composting area. What do you do with facilities dedicated to the production of 100,000 tom turkeys a year? Luckily (it turned out), about 15 other turkey growers faced the same problem. And because it was a broad problem—the future of an entire regional industry—the state of Michigan saw an economic and social interest as well. With help of the state, the work of poultry scientists at the land grant university, the desire of growers to continue growing turkeys, and the skills and needs of former Bil-Mar employees also facing loss of jobs and careers, the industry was saved within a new structure.

Today, growers and workers within the Michigan Turkey Producers' Cooperative are producing about 4.5 million heavy tom turkeys a year, processing them through their own plant, and selling turkey meat to end users. A brand name, "Golden Legacy," has been developed for, as Bil-Mar aptly perceived, the real money is in marketing branded products.



These turkeys are close to market weight of 40 pounds.

The new structure is no less integrated than it was under Bil-Mar. But now, the 15 growers sit on a board of directors and make decisions once made by Bil-Mar. These decisions affect the strains of birds the growers produce, the size the birds will be at slaughter weight, feed, and the kind of products the cooperative will sell. The members also attempt to keep antibiotic use low, but antibiotic use is not proscribed. "It's been six months since we've used any medication in the brooder barns and more than two years since we've used them in the grower barns," Joel said. "But not many producers can say that."

Joel's father, John, was an important driver in formation of the cooperative. As his work was starting to pay off, he died of cancer at age 61. So Joel is now the sole proprietor of Trestle Town Turkeys, Hamilton, Michigan. He is production-oriented, he said, and is pleased that his dad's legacy includes a friendly marketing structure in which his skill and experience growing turkeys can pay off.

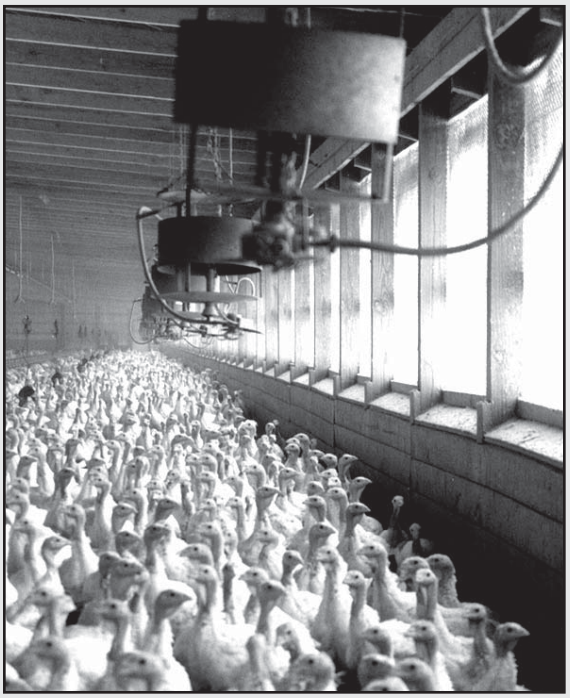
Production system

The production system at Trestle Town involves starting 17,000 day-old turkey poults every eight weeks. They stay in one of two 40 ft by 216 ft brooder barns for five weeks before moving into one of four 55 ft by 476 ft grower barns, where they gain about 0.3 pounds per day, reaching a 40-pound live weight at 19 to 20 weeks of age. They will dress about 88 percent and produce a large breast commanding a premium price, some intermediate value products, and ground turkey, the residual product.

"Turkeys are highly sensitive to their environment," Joel said. Success for the producer depends upon how well he is able to monitor the environment, interpret what he sees, and respond quickly. Poults need heat, even more than chicks. Bussis heats the area within two 10-ft diameter cardboard rings with 12 radiant heaters, each suspended seven feet above the floor below. Each ring holds 720 baby turkeys. Temperature at the top of the softwood shaving litter is kept at 105 degrees at day one, and can be dropped one degree per day as they grow older. Thermometers—and bird behavior—are used as monitors. "Their behavior tells you whether they're comfortable," Joel said. "They pant if they're too warm and huddle if they're too cold." Radiant heat heats what it touches, not the whole environment, so room temperature is about 88 degrees—still pretty warm. When the turkeys leave the brooder barns, they need 75 to 78 degree temperatures. By 16 weeks, they need temperatures of 50 to 55 degrees, and cooling becomes more important than heating, except in winter.

The grower barns are naturally ventilated in summer but power-heated and ventilated in winter. Curtains 5.5 ft tall cover the top sides of the 10-ft tall building sidewalls and can be rolled up or down depending upon temperatures inside and out.

Mortality is a fact of life with poultry, Bussis said. What has to be prevented is catastrophic loss. The farm has "stand-by generators in case of electrical failure. "When I was young and we were producing eggs, we lost 40,000 pullets in cages in a power failure," Joel said. In heated, ventilated brooder barns, heat and ventilation systems have to work.



Feeding system, waterers, heaters, fans for ventilation and side curtains in a grow-out building.

Sudden loud noises—such as sonic booms—can cause problems. Turkeys, when frightened, will rush away and pile up, with massive death loss possible from suffocation. But, Joel said, that's rare. "Turkeys are inquisitive and gregarious. They want to be around anything different. When you enter the barn, they gradually crowd around you—while chickens will run in the opposite direction."

"Coccidiosis is the more common disease that can hurt you," Joel said. Coccidiostats are added to the first four brooder rations. (The birds are fed nine different rations of various protein and energy levels over the 19 weeks of their lives.) Vaccination is used to prevent hemorrhagic enteritis, one of several poultry diseases that can take the joy and profit out of raising turkeys. "There are a lot of potentially deadly diseases and deficiencies," Joel said. Access to his poultry buildings is strictly controlled to prevent spread of contagious diseases.

Even with good management, a 10 percent death loss is "decent," 8 percent "really good, excellent" and 11.5 percent "OK," he said. Luckily, losses are greatest at the start, when poults may not adjust to feed during the first five days, a time of "starve-out." Turkeys are notorious for heart problems and leg problems, which gradually take a toll on the birds, even some that are

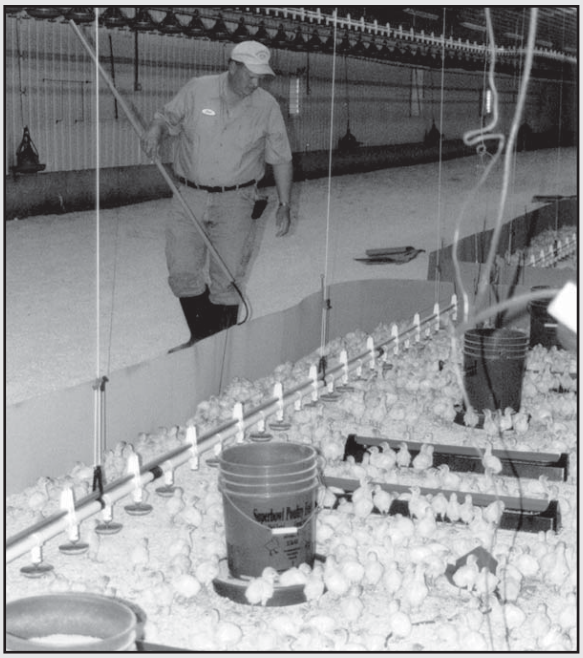
almost fully mature, and "birds are naturally cannibalistic," Joel adds. The term "pecking order" came from a common bird behavior in which weak birds are attacked and often killed.

Some people think that turkeys would be better off in less restricted environments—open or free range. Joel doesn't agree. "Some people do grow turkeys in open range," he said. "But you lose your control over the environment. Skunks, opossums, raccoons—a whole range of omnivores and rodents—spread diseases such as cholera. Birds such as starlings carry avian influenza and mycoplasmic diseases." Joel likes his turkeys inside, where he can exercise effective environmental controls.

Family-size business

While 100,000 turkeys sounds like a lot, Joel said his is really about a family-size operation. He employs one other person full-time. His wife and three daughters, ages fourteen, twelve and ten, work when new poults arrive and must be settled into their new homes, 720 to each cardboard ring. From then on, it's a monitoring process for Joel and his employee. Daily chores include:

- Monitor new poults. They need to be checked every couple of hours during the first few days. Little turkeys can die if they get turned on their backs as they sleep, so Joel walks through, staff in hand, and stirs up the sleepers.
- Pick up dead birds.
- Check and move drinkers, which hang from the ceiling. If litter is wet, fork it up so it dries and remains friable.
- Check feeding system. Feed moves into feeder pans from bins serving each barn. There are two 18-ton grain bins at each grower barn and two 9-ton bins at the brooder barns. Flexible augers deliver grain to feed pans suspended from the ceiling.



Two-day old turkey poults in brooder house, 720 poults within each ring.

It takes about an hour per barn per day for this monitoring, Joel said. Other routine, but not daily, tasks include manure management. Joel is one of a few poultry producers who composts manure. He uses four acres of land and generates 1,500 to 2,000 cubic yards of compost each year. "We hope to cover our costs," he said of the composting operation. Joel sells the compost, mainly to organic farmers. As markets become better established and more growers see the value of compost, he hopes it will command a profit. "We no longer make sales of small quantities," he said. "It is just too time consuming." But with just a few acres of land, and no crop production, manure has to move away from the farm, and do so in a nonoffensive manner. The farm is right outside the town of Hamilton—and upwind. The manure composts "acceptably," Joel said. All barns are bedded with softwood shavings. Each brooder barn is cleaned out completely and disinfected between batches of poults. Brooder barn waste is high in shavings (carbon) and low in manure (nitrogen).

Grower barns need not be cleaned completely or often. The litter in the growing barns is kept dry and aired out by mechanical rototilling until the barns become so crowded with maturing birds there's no longer room for the tractor. During the last few weeks, a crust of concentrated manure builds up, and is removed before a new batch of birds comes in. High-nitrogen manure and the brooder barn shavings compost fairly well. Overall, he said, the carbon to nitrogen ratio is 15 to 18 to 1; an optimal level would be a higher carbon 30 to 1.

Turkey manure composting. Joel Bussis markets the compost to local farmers.

The compost is short one element—water. "The manure cake is quite dry, 17 to 22 percent moisture, and the brooder manure is drier still," Joel said. "You need 40 to 50 percent moisture to get a good heat going." He piles the manure into windrows and waits for rainfall to raise the moisture level. A 1,500-gallon water wagon can be used to add water if needed. Composting is a key part of the operation, for without a good waste disposal system the operation is not viable.

Feed and feeding are highly automated. Trucks bring prepared feed several times a week, unloading it into bins. Flexible augers move the feed from bins into feeders.

The Cooperative

The term used to describe the organization of much of the poultry industry is "vertical integration." When Bil-Mar informed its contract growers of the company's plans, it didn't call it "dis-integration" but "de-verticalization."

Dr. Allan Rahn, a poultry economist at Michigan State University (MSU), analyzed the potential impact of Bil-Mar's decision. A conservative estimate of the economic impact that elimination of the growing, slaughter, and boning of turkeys would have had on the region's economy was $171 million and 1,344 jobs, he said. Roughly $113 million and 464 of the lost jobs would be accounted for by farm level impacts. Bil-Mar's move would also have had adverse consequences on local corn and soybean market prices, as the growing turkeys used more than two percent of the corn and almost four percent of Michigan's soybean production. The remaining dollar and job impacts were attributed to the slaughter and boning activities, mitigated somewhat by other value-adding activities Sara Lee planned to conduct in the reclaimed space at the Zeeland plant.

Faced with the economic consequences of the shut-down, the turkey growers had to decide whether to meekly quit or try to protect their industry. They decided to join together and face the problem as a group rather than as individuals. They created the Michigan Turkey Producers Cooperative (MTPC), electing John Bussis their first chairman of the board. Ultimately, they acquired property and, using cutting-edge technologies, retrofitted an old plant to perform the turkey slaughter and processing operations that Bil-Mar had discontinued.

MTPC's facility started accepting birds for processing the week of March 6, 2000. Remarkably, Rahn said, this occurred only slightly more than a year after Bil-Mar closed its plant. When the growers decided to band together and form a cooperative that would replace the Bil-Mar structure from growing to processing to marketing, they had only a few resources to start. They had their own on-farm investments to consider. They had a pool of Bil-Mar employees who had skills and were losing their jobs. But they had no processing plant and no market.

First, they turned to Rahn, the MSU poultry economist, for his opinion. Dan Lennon, the chief executive officer and general manager of the finished plant, said: "Al Rahn did most of the in-the-trenches work for us, meeting with our growers and helping us figure where we'd fit in the industry and what the opportunities were."

Rahn received funding support from MSU's special Animal Agriculture Initiative and also from MSU Extension. Ottawa County, where the Michigan turkey industry was concentrated, chipped in county money and Extension help to organize the growers. Extension agent Chuck Pistis still serves as the co-op's recording secretary. A retired MSU Extension poultry economist, Bud Search, helped the co-op develop a new brand identity, called "Golden Legacy."

The new cooperative located an idle potato processing plant in Wyoming, just south of Grand Rapids in western Michigan. While the exterior of the plant is warehouse-like and nothing special to look at, Lennon describes the interior as "top drawer." "This was the first new facility built in the U.S. in 15 years," he said. "It is state-of-the-art, incorporating all the newest knowledge for safe food handling."

The plant was set up to process 4.25 million turkeys a year, producing boned turkey meat valued at about $72 million. Plans included adding further-processed, value-added cooked products under the name "Golden Legacy," at some point in the future. Those original goals have been met or exceeded, Lennon said. Despite some bad years for turkey since 2000, the plant has sold at least $72 million worth of products each year. Running one full shift a day, it processes 4.5 million birds a year. It has captured contracts with the state of Michigan's Department of Corrections to provide cooked and raw turkey to state prisons. It has contracted with other companies to prepare cooked turkey products valued at about $10 million a year. It has added one grower member to the original 15, and several growers have expanded production.

Biosecurity: a warning sign at the entrance reminds visitors of the need for disease control.

The plant originally hired 215 line employees and 55 in sales and management—many of them experienced Bil-Mar workers. It now has 400 employees. The facility cost more than $20 million to build. Funding came from CoBank, part of the Farm Credit System, on condition that the co-op members raise half the money. The 15 grower members contributed most of it, but some came from outside investors. Several of the grower loans were guaranteed by the USDA's Rural Development Agency.


Layout of the building complex. Open land is rented out to a grower of plant nursery stock.

So the story is not just of the growers and the cooperative, but of a broad base of cooperation from public agencies of all sorts. Joel Bussis is proud of the role his father played. The Golden Legacy brand has literal meaning for him.

Summer 2007 Update

We caught up with Joel on a Thursday afternoon, just before rain was scheduled to blow in. Their turkey production and processing has not changed much since 2003, when he was originally interviewed. The only change in their operation has been that they are no longer renting out a small part of their acreage for cut flower production, but are haying it instead. In fact—he was heading out the door to put hay up ahead of the rain!

Traditional Management: Confinement and Semi-confinement

Traditional poultry management is the system that has been used for generations by commercial poultry growers. Houses may be newly constructed barns or renovated outbuildings. Hens and broilers, in flocks of 500 to 5,000, are stocked at a rate of up to six square feet per bird and allowed to roam a well-littered barn floor. They are given continuous access to complete feed and water. In some cases, birds may be allowed to scratch in a small, adjacent yard. Generally the birds spend most of their time confined indoors, making the traditional management alternative a suitable choice for year-round production.

Traditional Management Overview

Birds:	Chickens, turkeys, and waterfowl
Land:	Level area to accommodate barn and yard size
Stocking density:	Four to six square feet per hen or broiler
Buildings:	Retrofitted barn; new insulated and ventilated house
Equipment:	Automated or non-automated feeders and waterers
Labor:	Semi-intensive
Operation:	Year-round
Marketing:	Moderate capital investments, low return on equity, predictable annual income
Advantages:	Relatively inexpensive compared to industrial alternative; can use existing housing and used equipment
Disadvantages:	Increased risk of parasite/pathogen build-up in house; air quality must be managed carefully; independent marketing.

Birds and Performance. Broilers, turkeys, and laying hens are the most common birds reared under traditional management. Growers can mail-order day-old chicks from independent hatcheries or breed their own replacements on the farm. Favored breeds include the Cornish Cross for broilers and the Gold Star, Red Sex-Link, and Black Sex-Link for layers. These breeds are known for their quick growth rates and productivity. Layers are managed on an "all-in-all-out" practice. Producers try to time laying so that all hens reach their peak within a few days of one another. This makes it easier to control the hens' molt and induce a second laying period among the entire flock. After second lay, most commercial growers replace their flocks.

Housing. Traditionally managed birds are housed indoors in nonportable buildings year-round (though some producers provide access to dirt or cement yards). Floors may be covered in two to three inches of litter or bedding material. No cages are used; broilers and hens are free to move about inside the building with considerably more space than that given to industrial flocks (approximately one-and-a-half square feet per bird for broilers and up to six square feet per bird for geese). Plastic pools or swimming tanks may be added for waterfowl. In some cases, the building may be divided to provide separate brooding, laying, or grow-out space (see traditional chicken coop housing diagrams in Carol Ekarius' *How to Build Animal Housing* in **Resources** under *Housing*). One or more raised feeding and watering stations (located in the middle of the house) are shared by the flock. Water lines are buried to prevent freezing during winter. Air quality is controlled using automated and/or natural ventilation systems. Most layer houses are windowless. Artificial light is used with layer flocks to control molting and maximize egg production.

Houses may be constructed new or retrofitted from an older barn. New houses are often built upon a concrete slab or gravel/earth floor foundation. Wooden floors are not used, as they can become damp and rot. Materials such as two-by-four and two-by-six wood studs are used for framing the walls and roof, which can be covered with shingles or tin. Walls are usually sided with plywood, covered with 6-mil polyethylene film inside, and insulated. Supplemental heat may or may not be required depending on insulation, site location, and stocking density. If you are building from scratch, you will need to obtain a building permit from your municipal government office.

Old barns and outbuildings may be retrofitted by adding utilities, feeding stations, nesting boxes, roosts, vents, lights, and heat. Minnesota grower Alvin Schlangen, for instance, converted his ten-year-old 48 ft by 368 ft high-rise style barn (originally built to contain 80,000 caged layers under contract with an integrator) to a multilevel house for 6,000 layers. He lined the walls with a poly-type plastic to improve insulating capacity. He also covered the plywood floor beneath feeding stations with plastic to protect against rot. Alvin cut several side openings in the barn to give birds yard access between May and October. The barn is also equipped with two 24-inch exhaust fans, a 500,000 btu corn-burning furnace, and overhead fluorescent lighting. Alvin added standard galvanized nesting boxes (ten spaces per box), floor pan-feeders, and a nipple watering system. He uses natural convection cooling in summer months to reduce energy demand.

Nesting boxes in Schlangen retrofitted barn.

For more information, including traditional poultry housing designs, see *Small Scale Poultry Housing* by the Virginia Cooperative Extension Service, *How to Build Animal Housing* by Carol Ekarius, and *Renovating and Retrofitting Older Broiler Houses* from Auburn University. The Ekarius publication, though geared toward industrial managers, has some good tips and diagrams to help with the installation of insulation and ventilation equipment in older barns (see **Resources** under *Housing*).

Feed and Water. Birds raised indoors must be fed a complete ration with protein levels appropriate for their species and age. Traditional growers often use medicated feed to help control disease and illness among their flocks. Feeders are filled daily and fresh water supplied continuously.

Equipment and Supplies. As a traditional manager, you'll need some or all of the following equipment: fans; heaters; brooder stoves; hanging plastic or galvanized metal feeders; nipple waterers, founts or plastic jugs; garden hoses; nesting boxes; roosts; and egg collection crates.

Much of this equipment is available automated or nonautomated. Automated feeders, waterers and egg collection equipment can make work much easier. However, automated equipment is geared toward larger flock owners — those who manage several thousand birds or more. Schlangen and Wisconsin grower Dean Dickel both say they have had trouble finding automated equipment geared small enough for their 4,000- to 6,000-bird operations (personal communication, 2004). "It's real tough to automate these buildings in Wisconsin," said Dickel. "With 98 percent of the laying in this country done in cages, you're kind of on your own if you want to do things differently" (see Farm Profile: "Traditional" Doesn't Mean "Old-fashioned" on Dickel Farm).

If you plan to manage a smaller flock, nonautomated equipment may make the most sense practically and financially. Ekarius includes excellent construction plans for homemade nesting boxes, roosts, and feeding troughs in her book, *How to Build Animal Housing*, as does Leonard Mercia in *Storey's Guide to Raising Poultry* (see **Resources** under *Housing*).

Health and Welfare. The most common health concern for traditional growers is disease. Generally, predators are not an issue because birds are confined indoors. Disease, however, can spread quickly from one bird to another or from rodents. Traditional managers use a variety of disease-prevention measures including medicated feed and vaccinations. Growers may further control disease by maintaining "closed" flocks. Ekarius notes that by dividing a barn into two "rooms," growers can further limit the spread of disease by rearing birds of different ages separately. Rodents are discouraged through brush control (keeping the area around the barn clear of weeds), raised floors (1 ft off ground), tight feed storage, and traps.

One final concern is smothering. Because birds are confined but not caged, there is a risk of smothering, particularly when a high stocking density is maintained. Wisconsin grower Dean Dickel said suffocation (caused by flocks crowding in corners) has proven to be a more serious problem than disease.

Labor. Daily chores include filling feed troughs or buckets, checking on water, observing birds, and collecting eggs (if you have layers). During the brooding phase, the workload is a little heavier as chicks require regular monitoring. Likewise, the workload will increase when it comes time to catch birds for market. Several hands may be needed to move your birds from barn to crate and truck. Seasonally or between flocks, the barn floor must be cleaned and disinfected. You can do this manually or with the help of a skid steer loader if your building can accommodate one. Pressure washing the walls and floors is common practice in newer buildings. New litter is usually added after the floors have been cleaned.

Finances. Traditional management system expenses vary widely with your choice of new or used housing, equipment, and, of course, flock size. Ekarius has developed a budget to help you estimate the cost of building a new poultry barn. New housing budget items include:

- Loan costs
- Liability insurance
- Building permits
- Temporary utilities (during construction)
- Excavation
- Footings
- Foundation
- Concrete for slab
- Framing lumber
- Doors
- Roofing
- Siding and trim
- Heating, venting, and insulation
- Plumbing
- Electrical
- Waste disposal (sewer and septic)
- Equipment rental
- Windows

As for equipment, you'll need to price feeders, waterers, nesting boxes, and pools. Day-to-day operating costs should include an estimate for birds, feed, litter, utilities, and labor.

Summary. Traditional production is perhaps the most flexible management alternative because it can be adapted for year-round or seasonal production (depending on your goals and investments), operated with or without automated equipment, sized for large and small flocks, and combined with yard systems. Most traditional growers renovate existing outbuildings or barns, making this alternative a much less expensive investment than industrial confinement production.

Dean and Mary Dickel, New Century Farm
Shullsburg, Wisconsin

Dean Dickel takes his eggs to Madison, Wisconsin, each Thursday in this refrigerated truck.

"Traditional" Doesn't Mean "Old-fashioned" on Dickel Farm

In 2003, Dean and Mary Dickel's Southern Wisconsin New Century Farm sold more than a million organic eggs from 4,500 laying hens housed in a handful of small, renovated buildings that once held hogs, cattle, and horses. Ten years after starting by selling turkeys and a few eggs to neighbors, egg sales provide the Dickels with the majority of their family income.

They had no experience with poultry when Dean began managing a small laying flock for his landlord in the early 1990s. Dean had grown up on a conventional Iowa livestock and crop farm, but couldn't make it financially in the 1980s with a 600-acre hog and cash crop operation of his own. Dean went back to school for a degree in journalism, and for a decade worked at newspapers in Iowa and Illinois, sometimes writing articles about farmers. He clearly remembers visiting a Wisconsin dairyman who relied on management-intensive grazing for his cattle and tried to avoid "farming" because he couldn't afford to "farm." "That was the most profound thing I ever did," Dean describes. He started doing more articles about farmers who were successfully employing alternative production and marketing methods. Dean, who was becoming tired of working for someone else, started plotting his return to agriculture.

Dean and Mary, who also worked for the newspaper, developed two goals. One is to be "economically viable," which to Dean means setting his own price for his products while adopting production strategies that control costs. The other is to be environmentally and ecologically sustainable, and thus provide a legacy of stewardship for future generations. The Dickels wanted a good environment in which to raise their two children.

While still working their newspaper jobs and living at the rented farmstead, the Dickels gradually expanded their laying flock to 900 hens as local demand for their eggs grew steadily with relatively little marketing effort. In 1996 they purchased seven acres that had a house and several older outbuildings, and started building the egg business toward a goal of 3,000 laying hens. Dean quit the newspaper that year, and Mary quit two years later, although she still does part-time writing and editing work.

Facilities and operations

From the start, Dean's production model was driven by his goal of developing egg marketing into a year-round enterprise that could provide a full-time family living. Dean felt that a pasture-based production system that kept groups of layers housed in portable buildings regularly rotated among grass paddocks, would not meet his marketing goals. He said the farm is too small for pasture programs that have capacities of 250 to 450 birds per acre. Also, weather conditions in southern Wisconsin normally allow layers to be pastured for little more than six months each year. Dean views pastured poultry as fitting within a diversified marketing program in which eggs are a seasonal product.

New Century Farm's new egg processing and storage building under construction.

However, the Dickels felt they needed to differentiate their eggs from larger competitors. The decided to certify their operation under organic standards, which require organic feed and access to the outdoors when weather conditions permit. Dean considered building a new facility capable of housing at least 3,000 birds while also providing an outdoor run, but did not like the prospect of paying for it. "And I wasn't sure I would have the markets for that many eggs right away," he explains.

So he decided to pursue a strategy of gradually renovating the farmstead's existing buildings by clearing inside spaces of obstructions and adding heating, insulation, and ventilation. Two smaller sheds hold about 750 laying hens, while a third houses 1,500. Each provides about one-and-a-half square feet of free-roaming interior space per bird, while the outdoor lots offer at least ten square feet during about half the year. Dean recently started contracting about 30 percent of his production out to an Amish farmer who manages the hens in similar fashion.

Three times a year, the Dickels purchase a group of 1,500 day-old chicks from a proprietary breeding firm. They prefer a breed that lays brown eggs because the shells tend to be thicker and less likely to break during transport, and because their customers prefer brown eggs. The young birds spend 17 weeks in one of two renovated starter barns heated with gas-fired brooders and bedded with about four inches of wood shavings. Laying buildings are also bedded with shavings. "The big thing you learn about chickens is that you have to keep them dry," Dean emphasizes.

With a portable mill, Dean mixes a laying ration that includes organic-certified corn, soy meal, a small grain, a vitamin-mineral pre-mix, and a free-flow calcium product. He struggled to find affordable feeding equipment that could be converted for use in his cage-free buildings. "It's real tough to automate these small buildings in Wisconsin," he warns. "With 98 percent of the laying in this country done in cages, you're kind of on your own if you want to do things differently." Eventually Dean found a used, push-button feeding system from a pheasant barn that includes flexible augers within 1.5-inch diameter piping. He suspended the auger 18 inches above the floor, and it drops feed into pans below. Water is supplied by a low-pressure valve system fed by overhead pipe. The laying buildings are kept at 50 to 60 degrees through the winter months.

Each spring, Dean waits until warm weather has settled in before opening the doors to dirt lots bounded by 4-ft high wire mesh that is topped with a single electric wire to keep predators from climbing over the top. He said egg production decreases about five percent when the move is made. "But they definitely are healthier from being outside," he said. The building lights are left on after sundown to draw the hens indoors each night, although the access doors remain open during warm nights. The facilities are cleaned once a year with a skid loader. Dean composts the material and sells it to local farmers.

Dean said he used to worry about major death losses since organic rules prohibit antibiotics. However, predators and suffocation caused by flocks crowding into corners have proven to be more serious problems. "Compared to disease, we lose five times more chickens to smothering and accidental death," Dean said.

Layers have access to an outdoor run for about half the year.

Egg processing

Old-fashion laying boxes hang from the walls, and eggs are gathered each afternoon and placed in plastic milk crates. The boxes are bedded with wood shavings, which keep eggs cleaner than straw bedding. Cleaning, sorting, and packing take place in a converted one-car garage attached to the farmhouse. Dean found a used processor for $2,000. Dean places the eggs on a conveyor chain at one end of the unit. They pass over a high-sodium light to be candled for cracks before going through a hot water wash. After washing, the eggs are automatically sorted by size at the other end of the processor. Mary places the eggs into cartons with a bar code and "New Century Farm" labels. Most are then packed in boxes holding 15 cartons, and placed in a cooler. Dean then loads many of the cartons into a refrigerated panel truck for delivery to customers. Daily tasks normally take Dean and Mary about one-and-one-half hours to complete.

Marketing

"What makes this whole thing work is the sales," Dean asserts. "I enjoy sales. If I have something I believe in, I can sell it." About 80 percent of New Century Farm eggs are sold in Madison, Wisconsin. Restaurants buy 30 percent of the total volume, with groceries and food cooperatives accounting for most of the rest. Each Tuesday Dean spends two or three hours on the telephone with his regular customers to determine how many eggs they need. Each Thursday he makes the 90-minute drive to Madison. With 30 stops throughout the city, the trip usually requires at least 12 hours to complete.

Until the new processing building is ready, eggs are manually candled for deformities and sorted for size in the Dickels' garage.

The farm's wholesale price is $2.25 per dozen. Sales have steadily increased even though in 2003 Dean raised the price 25 cents to cover rising feed costs. He said this increase was easier to make because general egg sales and wholesale prices have risen sharply, driven by the popularity of high-protein, low-carbohydrate diets. Dean also credits the relationships he has developed with store and restaurant managers, and the flexibility he is willing to offer in helping these customers balance their inventories. "They get the eggs they want, when they want them," he explains. Dean believes that such service, along with low overhead, will keep his business competitive.

The farm's sales vary seasonally, with demand peaking during the Thanksgiving-Christmas baking season, and falling sharply during hot summer weather. The Dickels were forced to dump eggs during the summer of 2002, but in 2003-04, more often than not, they did not produce enough eggs to meet demand. In early 2004, Dean was purchasing 25 percent of his total egg supply from an Amish group in Iowa. Although this was cost-effective, Dean was not excited about making the 300-mile round-trip to obtain these eggs. "We've turned the corner from being just a producer to being more of a marketer," he said.

Organic production

In early 2004, Dean struggled with whether to maintain organic certification in the face of rapidly escalating feed costs, including soy meal that had reached $800 per ton. He said organic certification was important in developing his customer base, but may not be necessary to maintain that business. "Organic eggs have become a commodity, so customer service and cost are important," Dean said. "Organic gets you in the store, but quality and freshness keeps you there."

Growth concerns

The Dickels are also debating growth. In early 2004, the Dickels were making plans to build a new processing and egg loading facility that would provide the option of handling at least twice as many eggs with their current processing equipment. Dean said he and Mary do not want to put any additional labor into the business, but also need to face the reality that sales must increase to match rising expenses. "I hate to say that, because I used to say that's what's wrong with agriculture," he said. They hire help to gather eggs two days a week, and Dean is considering expanding contract production to more growers. "Rather than giving up my customers, I would rather hire someone to take care of my chickens," he explains. "I don't think integration is bad. It's just who's doing it."

Inexpensive laying facilities include wall-mounted egg boxes and a recycled feeding system housed in an old hog building.

The farm may also diversify its offerings rather than greatly increasing egg sales. The Dickels have provided some restaurant customers with vegetables from their market garden, and Dean would like to offer pasture-raised pork produced on contract. He is also thinking about starting a specialty breeding and hatchery business to produce hens that would do a better job of maintaining body condition and producing thick-shelled eggs under non-cage, organic production management.

Words of advice

The lack of automated equipment scaled to smaller poultry operations is a problem, Dean said. The organic egg market has become more competitive, and finding sales outlets is getting more difficult as major retail chains assume a larger share of the organic market. These stores want track records and prefer to deal with wholesalers who can provide a variety of products with each shipment. Dean said start-up egg producers need to realize that they are not going to automatically have markets for all the eggs they produce at the prices they want to receive. It is better to grow slowly as the markets allow, rather than cutting prices on a large volume of eggs produced in the early stages. Overproduction is an unnecessary burden and financial drain. While producing too little for the marketplace is a lesser financial problem, it can be frustrating to both producer and customers.

Dean said that he learned from his first farming experience that financial management must not be neglected. Either the manager must be proficient in all aspects of accounting and finance, or these tasks should be farmed out to an expert. Most important, he urges prospective egg producers to gauge whether they would enjoy operating such an enterprise, and have the skills to be successful. "Just because something is profitable on paper doesn't mean it will work for everyone," he said.

Summer 2007 Update

Since their profile was published, New Century Farm has grown and branched out into new areas. They are currently at about 7,000 layers and plan to build a new 6,000-bird layer house, bringing their capacity to about 10,000 layers. They are planning to be energy self-sufficient within five years. Currently all their farm vehicles run on recycled vegetable oil fuels. They plan to convert to biomass heating with corn cobs, and then add wind and bio-diesel electric generation. They also are producing organic crops on 20 rented acres and hope to eventually grow all the feed they need for their poultry enterprise.

Day-range Management: Pasture

Day-range production is one of several popular pasture-based management systems. Housing is semi-permanent with perimeter fencing used to create multiple yards or pasture areas. Birds have continuous access to pasture from the house during the day and are locked in at night when predation is more likely to occur. Shelters made from relatively inexpensive materials are moved each week, month, or season, depending on bird species, flock size, pasture composition, and other management factors.

Day-ranging in the Upper Midwest is a seasonal management alternative. Most growers day-range their birds for six months or so each year, though there are exceptions like the Coon Creek Family Farm in Wisconsin, which allows winter ranging (www.cooncreekfamilyfarm.com). In Michigan, Minnesota, and Wisconsin, the typical pasture poultry season stretches from early May to late September or October.

During this short season, however, farmers in the Upper Midwest use day-range practices (also called "net range") to manage broilers and layers in commercial flocks of up to 25,000 birds (Hamilton and Hamilton, 2004). Commercial growers are drawn to the day-range alternative because it can be less labor intensive than the system developed by Virginia farmer Joel Salatin, who moves pens and birds to new pasture on a daily basis (see *Daily Move Pens: Pasture*).

In the words of Indiana day-range managers Andy Lee and Patricia Foreman, "This new production model [day-range] is less costly, higher yielding, and [has] lower labor requirements than other pasture-based poultry models, and can result in near zero mortality" (Lee and Foreman, 2002). Much of the information in this section comes from Lee and Foreman's book: *Day Range Poultry* (see **Resources** under *Day-range/Free Range*).

Day-range Management Overview

Birds:	Waterfowl, Bourbon Red turkey, heavier and dual-purpose chickens, light colored breeds and replacement pullets
Land:	Level, well-seeded grass and legume mix pasture
Stocking density:	200 to 300 chickens per acre
Buildings:	Floored, machine-moveable shelter with lots of shade
Equipment:	Electric fencing, poultry netting, feed troughs, water fountains
Labor:	Feed and water daily; move fence daily or weekly; move shelter weekly, monthly, or seasonally.
Operation:	Seasonal
Finances:	Minimal investment
Advantages:	Niche marketing opportunities; no daily movement of shelters; low entry cost; complement to other livestock enterprises
Disadvantages:	Need tractor or skid steer loader to move shelters; increased risk of parasite/pathogen build-up around shelter; independent marketing; risk of predators.

Birds and Performance. Your choice of poultry species and breed is important if you want to make maximum use of your pasture forages and encourage healthy breeding stock. However, there are few specialized breeds for pasture in the United States at this time. The recommendations below come from a range of sources, including farmers themselves. Your decision about which species and breed to raise will depend on a host of factors including climate, soil topography and type, pasture composition, target markets, and your own management preferences.

Frank Jones puts out supplemental feed. Portable houses are moved frequently to provide fresh pasture, and limit manure build up.

Domesticated waterfowl, such as "weeder" geese, tend to do well on grass and, because they are easily corralled into shelters, require less labor than most pastured poultry (Manitoba Agriculture and Food, 2002). At about five to six weeks of age, goslings can "subsist entirely on good pasture" (Geiger and Biellier, 1993). Just about any waterfowl breed will perform well since grass is its natural food. Some waterfowl growers recommend choosing breeds that have light-colored skin and feathers because they do not absorb and retain as much heat.

Chickens and turkeys, though not as voracious as waterfowl, may consume up to 20 to 30 percent of their diet intake from pasture if offered good forage. Many producers who use pasture-based systems, including the day-range alternative, choose heavier breeds that feather early, are light in color, and are well-suited to roaming and foraging. Chickens will roam up to 40 feet from their house or shelter (Muntz, 1999). For poultry layers, the Barred Rock, Production Red (a commercial version of the Rhode Island Red), and Golden Comet breeds have been recommended as productive layers on pasture.

Growers who pasture turkeys and chicken broilers, however, don't currently have many choices. Specialty broiler genetics for pasture-rearing have been developed in Europe but are not yet available to farmers in the United States (Fanatico, 2002b). For this reason, most farmers who raise broilers commercially on pasture use the readily available Cornish-Rock Cross (usually called the Cornish Cross). The disadvantages of Cornish Cross birds are that they tend to have weak legs, poor heat tolerance, high incidence of heart failure, and tend to be poor grazers (Polson and Fanatico, 2002). Turkeys, like the Bourbon Red, are a favorite for pasture systems.

Some broiler growers are beginning to develop their own pasture breeding flocks. Tim Shell from Virginia began raising parent stock on pasture to produce hardier chicks. The Shells call their chicks "Pastured Peepers" or the "CornDel" cross (a mix of Cornish Cross and Delaware stock). The CornDel broilers are said to produce a four-pound carcass in nine weeks (as opposed to eight weeks with the Cornish Cross breed). While the Shells no longer offer hatchlings, Wisconsin breeders Julie and Vince Maro are now offering day-old CornDel chicks. Other growers are experimenting with heritage breeds, but warn that they take significantly longer to reach market weight. Because of the extended growth period, heritage birds consume more feed and often produce a tougher carcass. This may be all right if you are raising replacement pullets, where rapid growth is not desired, or if your customers want a heritage bird (Mercia, 2001).

See **Resources** under *Hatcheries* for a list of breeders that raise birds suitable for pasture production.

Pasture. The day-range system relies on good, well-managed pasturage (grasses, legumes, insects, and seeds). Pasture quality and maintenance play a big role in your birds' health and in your success. So, what's involved in managing pasture for poultry?

Seeding. Pasture should be planted with a special forage mix. Remember that poultry are not ruminants and therefore won't do as well as some other livestock on predominantly grass pasture. Chickens, for example, are said to prefer broad-leafed plants and legumes, such as alfalfa and red clover, to grasses. For geese, you may want to reduce the amount of alfalfa in your mix, although industry experts say that just about any tender forage and small grains will make good green feed for these water birds (Geiger and Biellier, 1993b). Holderread recommends the following mix for permanent pastures: Orchardgrass, timothy, brome, perennial rye, and one or two clovers. On lower lying, poorly drained land, reed canarygrass and meadow fescue are recommended forage for geese and other waterfowl (Holderread, 1993). You may also want to check out the **Resources** under *Pasture Management* for Upper Midwest forage publications by Craig Sheaffer and Dan Undersander.

Mowing, watering, fertilizing. In order for pastures and paddocks to remain palatable and productive, particularly during summer months, they must be kept short, watered, and fertilized. In most cases, the birds will take care of your fertilizing—after all, this is one of the most-touted benefits of pastured poultry. Lee and Foreman recommend that pastures be maintained at four to eight inches. "If the grass is much taller than eight inches, the birds eat less and it also makes the pens more difficult to move" (Hamilton and Hamilton, 2004). Moreover, by rotating frequently and confining geese and other "heavy polluters" at night (as prescribed for day-range management) you will reduce the amount of grass that is trampled and matted down with manure. In other words, by locking up your birds in their shelter at night you are protecting your birds from predators and preserving forage quality.

Rotating. Last, and perhaps most importantly, your birds should be rotated among pastures to prevent pathogens and intestinal parasites and to encourage foraging on fresh greens. Rotation gives pasture time to rest and recover and can be accomplished in two ways. The first is by moving feed and water around daily within the paddock to spread traffic. The second way is to isolate ranging sites from the shelter by dividing the area into smaller yards or paddocks with poultry netting. In this way, birds are rotated daily, weekly, or monthly between paddocks. The frequency of paddock rotation will depend on several factors: stocking rate, pasture composition and quality, bird species, and the amount of supplemental feed provided. The less frequent your rotation, the more likely you are to have nitrogen problems around the house, since concentrated manure can burn the grass rather than fertilizing it.

Housing. Regardless of whether you raise chicken broilers or laying hens, turkeys, or ducks, day-range housing needs to be portable, weathertight, and predator proof. All shelter designs have doors or access holes to a fenced pasture area. Pastures are enclosed with electric, predator-proof perimeter fencing and divided into paddocks using one-inch poultry netting. When it comes to the perimeter fencing, livestock specialist David Pratt said "More elaborate designs are often needed for predator control. A high-tensile fence design that has effectively prevented dog and coyote predation consists of nine wires mounted at heights of 5, 11, 17, 23, 30, 37, 44, 52, and 60 inches. Every other wire is electrified (including both top and bottom wires). Wood posts are spaced 75 to 100 feet apart with fiberglass stays installed at 20-foot intervals." Contact the Center for Integrated Agricultural Systems (see **Resources** under *Agencies and Organizations*) for more information about pasture fencing and installation.

Machine-portable broiler house.

Broiler house. Day-range housing typically is used for more mature birds in the growing, laying, and finishing stages; but because they are semi-permanent structures, you may be able to convert them for use as brooder houses quite easily. There are many moveable broiler housing options thanks to ongoing innovation among poultry farmers. Oregon chicken farmer Robert Plamondon describes some of these housing alternatives in *Range Poultry Housing*. He divides housing into daily move shelters and machine portable houses. Daily move shelters are discussed in the next section, *Daily Move Pens: Pasture*. Two machine-portable housing alternatives, popular for the day-range systems, are outlined briefly below. Both of these housing options are inexpensive and relatively easy to construct.

Machine-portable houses are basically buildings on skids. They may be constructed from greenhouses, tents, sheds, hoop houses, or mini-barns. Most have floors and use litter, though there are some growers who prefer a floorless shelter. Plamondon discusses the advantages and disadvantages of various construction designs and materials in *Range Poultry Housing*, as do Herman Beck-Chenoweth in *Free-Range Poultry Production & Marketing* and Anne Fanatico in *Sustainable Poultry: Production Overview*. All of the machine-portable houses, however, do have one thing in common: they are designed to be more durable and wind-resistant than hand-moveable pens, yet small enough to be moved by tractor. Construction costs will vary according to design, size, and the materials used.

Figure 26: Day-range Housing Considerations

- **High winds.** Lower, heavier houses will generally be more windproof than taller, lighter houses. Staking down houses works quite well. Choose a plan that has been tested for at least one year in exposed locations.
- **Heat and cold.** Housing should be rain- and windproof while providing some protection from the sun during summer and cold during winter. Mature chickens can tolerate low temperatures, but production will suffer if drinking water freezes of if they do not have a windproof area in which to sleep.
- **Predators.** Protection from nighttime predators is essential. Floors provide some protection against predators.
- **Turf destruction and parasite build-up.** Chickens must be moved to new areas before turf damage becomes too great. Concentration of manure can create conditions conducive to pathogens and parasites.

Source: Plamondon, 2003.

One of the most popular day-range shelter choices is the hoop house (see www.cooncreekfamilyfarm.com for photos or *Range Poultry Housing* by Robert Plamondon for drawings). Hoop houses are structures made from arched pipe. Typically, the pipe is covered with polyethylene tarps. Hoop houses may be built with or without floors, but are almost always layered with litter inside. Lee and Foreman built 14 ft by 16 ft hoops to shelter batches of 200 to 250 broilers as part of their day-range management plan (approximately one square foot per bird). Hoops can be built to accommodate just about any flock size, are available by mail-order, and easy to assemble. If you choose to order a kit, pay attention to the type of ribbing material or bows that are used. As noted by Lee and Foreman, PVC pipe will crack in the cold and often does not stand up to snow loads. Farmers in Michigan, Minnesota, and Wisconsin will need to look for or construct their own hoop house frames from galvanized steel piping or some other comparable material. The major disadvantage of hoop houses is that they are made from lightweight pipe and plastic tarps — perfect kite material, unless secured to the ground.

Another day-range housing alternative is the wooden "mini-barn." Lee and Foreman constructed 8 ft by 16 ft mini-barns from chicken wire, galvanized tin and plywood to house 128 broilers (one square foot per bird) or 25 full-size turkeys (five square feet per bird). The roof was designed with a pitch to allow standing room for workers, and for turkeys, which like to roost high, they added above-ground roosting space. They did not insulate the structures. If you plan to use your house for year-round shelter in the Upper Midwest, you may need to add insulation or at the very least enclose the open walls with tarps or plywood. The entire mini-barn structure can be placed on pressure-treated skids for mobility.

Layer house. Either of the broiler housing options described above can be used for layers in the day-range system. However, you will need to reduce your stocking density, build-in nesting boxes, and add roosting bars for hens and turkeys. Lee and Foreman recommend roosting space of 7 linear inches per hen and overall floor space of 1 to 1.25 square feet per bird during summer (more space is required for the larger dual-purpose breeds). Plamondon recommends 2 square feet per hen. As the weather turns cold and your birds spend more time inside, you will need to give them a little more space. When there is enough insulation and ventilation to eliminate condensation, approximately 2.3 square feet per hen is recommended. If you are not controlling ventilation, then 4 to 5 square feet is advised (Plamondon, 2003).

Machine-portable layer house with roosting bar.

Making decisions about housing and shelter designs for your flock doesn't need to be difficult. Keep in mind the building considerations outlined by Plamondon in Figure 26 and choose the plan that seems like a good match for your site, climate, and situation—be willing to experiment.

For more housing information and designs, see **Resources** under *Housing*. Firms selling construction materials can be found under *Suppliers*.

Feed and Water. Research suggests that birds on pasture consume 5 to 20 percent of their feed needs from grasses, legumes, and insects (Mattocks, 2002). Experienced farmers like Joel Salatin and Ron Desens say forage consumption may be even higher—around 30 percent of birds' daily feed intake (see Farm Profile: Sleeping Cat Organic Farm). Forage intake varies by species and breed. Geese, for example, can be productive on a diet of only grass, water, and grit (Holderread, 1993). On the other hand, modern chicken broiler breeds like the Cornish Cross do very little foraging unless they are enticed with high quality grasses and legumes (Mattocks, 2002).

Regardless of how much foraging your birds do, they will need high-protein feed and mineral supplements, particularly during the growth stage for broilers and laying cycle for hens. Many farmers who practice pasture-based management provide this supplemental feed on a restricted basis; that is, they withhold feed when birds are likely to forage on their own. Birds on pasture tend to forage most often during the morning (when temperatures are cool) and on overcast days (Chisholm, et al., 2003). By removing feed during these times, you can encourage your birds to forage for more of their food.

Feed can be mixed on your own farm with supplements or purchased as a complete ration. Many day-range growers feed simple or low-protein feeds instead of complete rations as a way to encourage more foraging and to save on expenses. If the feed contains all or most of the dietary requirements, the chickens will depend on the feed instead of the forage. In *Pasture-Raised Poultry Nutrition*, poultry nutritionist Jeff Mattocks provides nutritional requirements and diet recommendations for chicken broilers and layers, turkey starters and finishers, as well as meat ducks raised on pasture.

Temperature affects how much birds consume, creating a management challenge for anyone using day-range or other pasture-based management alternatives. Pay careful attention to the changing water requirements of your birds during hot weather and ensure that water does not freeze for an extended period during fall and winter. Jody Padgham, editor of the American Pastured Poultry Producers Association's *GRIT* newsletter, reviewed four watering systems that are commonly used on pasture (open pan, bell, nipple, cups) and are appropriate for most species in the brooding, growing, laying, and finishing stages (see **Resources** under *Housing*).

Figure 27: Water Consumption of Layers Based on Environmental Temperature

TEMPERATURE (°F)	GALLONS PER DAY FOR 100 LAYERS
20-40	4.2-5.0
41-60	5.0-5.8
61-80	5.8-7.0
81-100	7.0-11.6

Source: Mercia, 2001.

Average water consumption needs, reported by the New England Poultry Management and Business Analysis Manual, are summarized in Figure 27.

Equipment and Supplies. In addition to shelter, you'll need some basic equipment and supplies. Your biggest piece of equipment will be a skid steer loader or tractor. Day-range growers also use portable electric perimeter fencing, poultry netting, feed trays or troughs, and waterers (see Figure 28).

Figure 28: Equipment Checklist – Day-Range Management

- ✔ Skid steer loader or tractor
- ✔ Housing supplies (hoops, roofing material, plastic tarps, plywood, chicken mesh/wire, roosting bars)
- ✔ Electric fencing
- ✔ Poultry netting
- ✔ Automatic or covered feeders
- ✔ Hanging waterers or water buckets and heaters (if necessary)
- ✔ Nesting boxes and liners (if used)
- ✔ Litter material

Younger birds need two-inch mesh fencing, while common woven field fencing will work for birds aged four weeks and older. If you are raising waterfowl and other heavy birds that seldom fly, standard 18-inch to 24-inch high fencing should do the trick. If you raise turkeys, captive game, or chicken breeds known to be more active, you may have to use a taller (36-inch to 48-inch) fencing.

Lee and Foreman built their own feed troughs from PVC pipe — an inexpensive option detailed in their book *Day Range Poultry*. Another option is to purchase ready-made, galvanized steel or heavy duty plastic feeders.

All feeders should be covered to prevent weather-related spoilage (wet feed will become moldy, unpalatable, and hazardous to bird health). Depending on the length of your production season, you may also require pan heaters for your waterers to prevent freezing (see **Resources** under *Suppliers*).

Health and Welfare. Many producers who practice day-range and other types of pasture management report low mortality rates, citing access to fresh air and sunshine, which can help break up disease cycles. Birds on pasture face three significant health risks as described under "Management Basics": (1) predators; (2) weather; and (3) pathogens and internal parasites transmitted by wildlife and other livestock. Some of the most important things day-range managers can do to maintain healthy flocks are:

- Vaccinate chicks.
- "Harden off" young birds before turning them out on pasture.
- Create predator-free shelters.
- Build weather-safe shelters with shade.
- Provide fresh water.
- Cover feed or place indoors so spilled grain won't attract wild birds.
- Rotate shelters and feeding areas to prevent pathogen build-up.

Responsible management, such as hardening off brooders and providing shelter at night, can minimize most predator-, weather-, and disease-related threats. "By using the electric poultry nets and closing the birds in at night, we have virtually eliminated predator losses in our broiler flocks," write Lee and Foreman. "And by hardening them off properly from the brooder and putting them back in their shelter at night so they don't get rained on, we have virtually eliminated death losses due to weather" (Lee and Foreman, 2002). Learning these skills can take a while; beginning poultry growers often experience high mortality among flocks when they first adopt day-range and other pasture-based management systems.

Birds raised in accordance with the day-range model face one additional risk: pathogen and parasite build-up around housing or shelter areas. Some critics of the day-range model warn that infrequent shelter movement creates a slow build-up of pathogens: "While the day range system may work great the first year, and the second, the pathogens in the paddocks and houses can increase until things become hazardous. This can be addressed [by moving shelters], but because it happens slowly it's easy to overlook or underestimate" (Eco-Friendly Foods, 2003). For this reason, some day-range producers are experimenting with different paddock/yard designs and rotations.

Labor. The size of the flock, type of housing, timing of paddock rotations, frequency of shelter movements, and experience affects labor load and the tasks involved. Birds and shelters are not moved daily; therefore the day-range system may be more suitable for owners of larger flocks, because it requires less time in the field. Most poultry growers who raise birds on pasture, say they spend most of their time:

- Feeding
- Watering
- Moving fences and netting
- Repairing fence holes
- Cleaning out brooder houses and shelters
- Rounding birds up during inclement weather

One grower mentioned feeling tied down to the farm when his birds were on pasture, since rain and extreme heat are potentially lethal.

PASTURE: DAY-RANGE

The Center for Integrated Agricultural Systems (CIAS) surveyed nine Minnesota and Wisconsin farmers who raised an average of 14,500 chickens on pasture in 2000 to learn about labor on large-scale pastured poultry operations. All nine farmers had been raising poultry for at least six years and had, at one point, raised chickens using daily move pens. Five had switched to day-range management and, at the time of the survey, moved housing weekly and fences daily. All of the farms performed their tasks by hand and relied heavily on family help. They spent an average of 2.6 hours per day managing their birds during the pasture season. Detailed labor results are reproduced from the CIAS report in Figure 29.

Figure 29: Average Labor Requirements for Pastured Chicken Production at Two Farm Sizes.

	NUMBER OF CHICKENS SOLD	
	4,000-10,000 (FIVE FARMS)	10,001-25,000 (FOUR FARMS)
Average # hours/year	656	1,814
Average # days/year	254	264
Average # hours/day during pasture season	2.6	6.9
Average # minutes/chicken in production	7.4	6.0
Average # family members	2.0	3.75
Average # hired workers	0.4	1
Average % of labor contributed by family	83	64

Source: Center for Integrated Agriculture Systems, 2003.

Finances. In addition to some one-time start-up costs, the biggest ongoing expense is feed. Some observers suggest that feed costs may be reduced with the day-range alternative because birds obtain some protein naturally from insects, worms, and plants on pasture (Fanatico, 1998). Reduced feed intake and expenses, however, may not translate into improved bird performance. No trials have been conducted to test bird performance and feed intake on pasture.

Minnesota and Wisconsin pastured poultry growers who took part in the CIAS survey mentioned above, reported earning $2.19 to $2.24 profit per bird in the year 2000. The profits come from reduced feed and housing expenses as well as above-average gross income. See Figure 30 for more financial detail.

Figure 30: Gross and Net Income from Pastured Poultry

	NUMBER OF CHICKENS SOLD	
	4,000-10,000 (FIVE FARMS)	10,001-25,000 (FOUR FARMS)
Gross income from pastured poultry	$39,000	$155,863*
Gross income per bird sold	$7.30	$8.61
Cash expenses per bird sold**	$5.06	$6.42
Net income per bird sold	$2.24	$2.19

Source: Center for Integrated Agriculture Systems, 2003.
**Does not include the largest farm with 50,000 chickens; however this farm's information is included in the per bird statistics.*
***Includes feed, chicks, buildings, and hired labor. Does not include family labor, capital, and land costs.*

PASTURE: DAY-RANGE

When preparing your own day-range budget be sure to include the following variable expenses:

- Pasture seed
- Houses or construction materials
- Covered feed and water equipment
- Fencing
- Fence charger
- Battery
- Hoses

See *Growing Your Range Poultry Business: An Entrepreneur's Toolbox* and CIAS *Generic Poultry Enterprise Budget* for a sample day-range budget—complete with expense and break-even estimates (**Resources** under *Budgeting, Enterprise Planning and Recordkeeping*).

Summary. The day-range system is an excellent alternative for those interested in experimenting with pasture production. Housing can be designed to accommodate birds seasonally or year-round and on a large or small scale. This management alternative requires less labor than the industrial and daily move pens models. Investments are minimal compared to the confinement housing models; however, a tractor is required to move shelters when necessary.

Frank and Kay Jones, Earth Shine Farm
Durand, Michigan

Frank and Kay Jones, Earth Shine Farm.

Pasturing Poultry Creates a Different Kind of Product

Frank and Kay Jones work hard to produce the kind of poultry products they do. And they expect to get paid for doing it. They charge $2.90 a pound for dressed broilers they grow on their 10 acres near Durand, Michigan, using labor-intensive methods, a topnotch, on-farm processing facility they built, pasture, and organically grown grains they grind themselves. They get $3 a dozen for eggs.

The enormous change that took place in the poultry industry starting about 50 years ago was all about labor. Confining hundreds of thousands of birds, broilers or layers, in buildings where they could be managed *en masse* greatly reduced the labor associated with raising poultry, and mechanized systems replaced manpower. It also changed the nature of poultry products. On the plus side, products were cheaper. Chicken wasn't just for Sunday dinner anymore. But it was different, too. Less exercised broilers mature at a younger age, the meat is juicier and more tender, but some say blander tasting. Layers on controlled diets produce eggs with yolks that are lighter in color and milder in taste.

Is "modern" poultry better, worse, or just different? The Joneses believe there are health and social issues to consider. Are confinement-reared broiler chickens exposed to too many antibiotics? Do they produce meat and eggs with an unhealthy balance of fatty acids? Is denying chickens the right to scratch in a pasture both less humane and bad for us as well? Some think so, including Frank and Kay.

To make poultry products their way requires, literally, that they get up with the chickens. They operate a day-range system, in which chickens come into shelter at night and go outside by day to feed and forage, confined only by an electrified net fence that keeps them within a hundred feet or so of their houses. Each morning at daybreak, Frank or Kay opens the houses to let the birds out, and every evening, after birds come inside to roost, Frank closes the doors behind the birds.

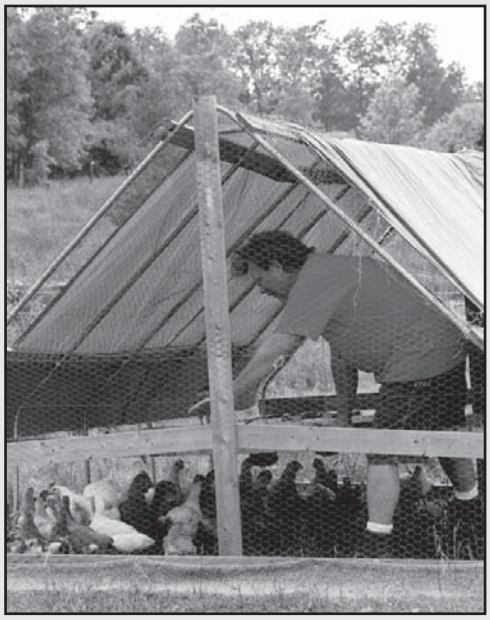
Housing

Why not just let the birds come and go as they please? The big concern is predators, Frank said, primarily foxes and raccoons, but also owls that could come into the roost areas and wreak havoc on the defenseless birds. While the electrified net fence offers fair protection by day, he doesn't consider it adequate for the terrors of night. So the birds are put into coops fortified with metal walls and chicken wire mesh.

Both the coops and the netting are portable, so when pasture gets eaten down or worn down to bare earth near the houses, the houses can be moved. Lots of variations are possible, but the Joneses like to move the netting three or four times to enclose fresh pasture before moving the houses. They have tried several other variations. They used the moveable pen system developed by Joel Salatin, but abandoned that. "It was just too much labor to move the pens to fresh pasture two and three times a day," Kay said. "The pasture area inside the pen was just too small and too many birds were injured while moving the pens."

They tried using more permanently placed houses and fences. These provided greater protection from predators, but sacrificed the advantages of pasture. The birds killed vegetation close to the building, and it was hard to provide enough pasture without fencing large areas. Manure collected in the buildings, which needed to be cleaned. Moveable houses just leave manure in place, to disintegrate naturally.

The Joneses don't know for sure just how much green grass and clover, bugs, and worms their chickens eat while pasturing, but probably less than 30 percent of their feed needs. Still, Kay and Frank are sure that pasture makes all the difference. Being outdoors and getting light, exercise, and fresh air is better than total confinement, but forage consumption is the key to quality meat and eggs, Kay believes.



Frank Jones checking on birds in machine-portable broiler house.

Birds

Frank and Kay use mostly Redbros broilers—the kind favored by French farmers who produce Label Rouge chicken. Most of the layers are Golden Comets, but there are other breeds as well. Frank and Kay buy some replacement layers each year and usually buy different breeds. They can tell bird ages by the breed, which include Barred Rocks, Rhode Island Reds, New Hampshires, Black Astralorps, and others.

Labor

On any given day, the Joneses have 500 to 600 chickens—250 of them laying hens, two batches of 100 growing broilers, and another 100 broiler chicks in the brooder house. In late summer, there are also 60 turkeys growing toward Thanksgiving. Each group needs daily care.

Eggs are gathered once a day, and dirty eggs must be washed. Designing the nests so eggs roll away after they are laid helps keep eggs clean. Frank enjoys building things, and part of his day is devoted to making feeders or building houses, roosts, and nests for layers. House construction is simple—two-by-fours, chicken wire, conduit bent into the proper shape, plastic tarps for roofs.

Feed and water

After Frank or Kay let the birds out in the morning, each group gets feed and water. Feeders are simple devices made of plastic eaves trough and are filled using a five-gallon plastic pail. Five-gallon buckets of water are inverted over special bases, dispensing water as it is consumed. The broilers are fed all they will eat, but the layers are limit-fed to keep them productive but lean. They feed twice a day.

Frank and Kay buy organic grains that Frank grinds in batches of 1,000 pounds with a portable feed grinder powered by tractor power take-off. Chicks need higher protein and a finer grind. Grains include oats, corn, wheat, soybeans, and field peas. The Joneses use Fertrell minerals and supplements.

Feed and waterer in pasture.

Health and welfare

Chicks need special care. They are kept in a brooder house, where heat lamps keep temperatures at the 95-plus-degree level young chicks need. Need for heat decreases rapidly, about one degree per day, and by the time they are three weeks old, the chicks can be moved into houses on pasture. It only takes seven to nine weeks to bring a broiler up to the four-pound dressed weight the Joneses want.

Layers are completely different, and quite a bit more frustrating, according to Kay. "For one thing, they are stronger fliers than meat birds," she said. They can—and do—get outside the net fence. They take up more space than the broilers, a factor on their small acreage. While broilers are summer projects, layers live much longer—several years.

There is really no "time out" with layers. They must be raised in a non-pastured environment for the winter and providing with supplemental lighting to keep their rate of egg laying high. Kay talks about getting out of layers completely—but would miss the income, as she and Frank have a strong market for eggs.

Marketing and processing

For Frank and Kay, the lure of direct marketing has been strong but the road slow-going. While they have processed and sold both eggs and broilers for five years, the "final look" of their Earth Shine Farm is still evolving.
Kay's interest is in selling healthy food to consumers direct and through the traditional marketing system. She would prefer to sell eggs and broilers to retailers and restaurants and not rely heavily on sales from their farm. It is difficult to make money from direct-from-the-farm sales of eggs, Kay said, if each sale involves a cup of coffee and conversation. Similarly, it's difficult to orchestrate 30 customers arriving to pick up two or three chickens apiece the day after butchering.

That is the approach taken by Virginia farmer Joel Salatin, described in his 1993 book *Pastured Poultry Profits*. The idea appealed to rural America and especially to those looking for a more sustainable and sustaining agriculture. Salatin described a low-cost production and marketing system by which a farmer could "net $25,000 in six months on 20 acres," generating wages comparable to having a good job in town by raising broilers in cages on pasture. Salatin gives the impression that marketing is no problem, that customers are waiting at his door, and that selling dressed poultry is simply a matter of taking orders. But farmers considering entering the business seem quite concerned that the opposite may happen for them. What if they have 150 fully grown birds, only 75 have been spoken for, and another 75 need freezer space? What does a producer do with birds for which no production contract has been signed?

The Joneses' experience is that customers have limited freezer space, don't buy large numbers of birds at once, are impulse buyers, and may not be willing to devote their entire poultry budget to their more expensive, organic birds. They confronted those realities, and decided to build a processing facility that could be government-approved.

The couple worked closely with local and state officials in designing a processing facility, which is nearly complete. They invited inspectors to review their plans. Inspectors from the Michigan Department of Environmental Quality, which deals in daily outputs of thousands of gallons of wastewater from large plants, saw very low levels of environmental threat in this facility that generates a few hundred gallons of wastewater three or four times a year. The inspectors were often challenged to wonder whether the standards they enforced were even applicable.

Frank designed the building in which they will kill and process about 100 broilers at a time. They intend to do several batches a year—perhaps 1,000 birds a year in all. The system will be about the same as the methods they now use.

The Joneses' new processing facility.

Currently, birds are killed and bled in four killing cones, then transferred to a scalder for 30 seconds in 140-degree water. Scalded birds go into a seven-bird-capacity picker and then onto a stainless steel table for evisercation. The last stop is an ice-water bath for cooling, but Frank and Kay don't like water cooling and plan to change that.

In the new building, birds will be hung on shackles and eviscerated as they hang. The hanging birds will be rinsed inside and out, then rolled into a cooler for chilling. The Joneses are convinced air chilling will produce a superior carcass that is firmer and less hydrated than water-chilled birds. They also believe there is less chance of bacterial contamination if birds are not plunged into a common water bath, and they want to avoid the chemistry, taste, and odors associated with using chlorine as a sanitizer.

The process will generate very little wastewater and less than two pounds of offal and feathers per bird. Yet Frank and Kay want to be sure they meet legal requirements. They built a 250-gallon holding tank for wastewater, which they will pump out and irrigate onto land. They are building a new three-bin composter to compost entrails and feathers.

When farmers venture into processing, they leave the traditional world of farming and enter the world of food processing—for Kay this also means educating consumers about food nutrition. She often refers them to a website, www.eatwild.com, which extols the virtues of pasture-raised animal products.

One clear image of what the Joneses are trying to achieve became evident October 5, 2002. They hosted a party and treated guests to a taste test, serving three kinds of chickens: two of them organically grown free-range birds of two different breeds and one from the supermarket. Labeled 1, 2, and 3, the differences were easy to see. Roasted the same way, two were firm and the muscle very distinct, one was softer in texture, juicier, and the muscle broke apart easily. Transparent beakers of fluid from the roasting pans told a story. The juices from the free-range poultry were "juices," while those from the supermarket bird divided into two levels, juices topped by a floating layer of liquid yellow fat.

Still, guests liked the chicken from the supermarket just fine, finding it juicier, tastier, and softer in texture than the chickens produced the open-range way. People have to want to eat healthier food, and want it enough to seek it out and pay more for it. The Joneses know such folks exist, and they're betting on them.

Summer 2007 Update

The Joneses have been processing in their new building, which is working well. They are pleased with their new protocol, which includes air chilling rather than water cooling. Rather than being held in a separate tank, the wastewater is composted along with the feathers and entrails in the bins. There have been small changes to other parts of their operation. They are no longer raising turkeys, for example, and no longer include field peas in the feed ration.

Daily Move Pen Management: Pasture

Joel Salatin is a Virginia farmer who popularized the idea of "pastured poultry" for broilers when he published *Pastured Poultry Profits* in 1993. We refer to this poultry management system as the "daily move pen" model. Since then, thousands of farmers across the country have adopted Salatin's daily move pasture model for poultry. This management system relies on daily movement of pens and is suitable for broilers, layers, and turkeys. Fresh pasture encourages foraging, which, in turn, improves bird performance and feed efficiency while minimizing the risk of pathogen and parasite build-up in the housing areas. In Salatin's words, the system can be characterized as "high density, short duration grazing." Pens make it relatively easy to move the birds and provide 24-hour shelter from predators and weather. We present an overview of the system detailed in Salatin's *Pastured Poultry Profits*.

Daily Move Pens Management Overview

Birds:	Cornish Cross broilers
Stocking density:	1,000 chickens per acre
Land:	Level, well-seeded grass and legume mix pasture
Housing:	10 ft by 12 ft by 2 ft floorless pens
Equipment:	Bell waterers, five-gallon buckets, nest material, dolly
Labor:	Feeding and water daily; move pen daily
Operation:	Seasonal
Advantages:	Raise large number of birds on small land base; 24-hour protection from predators; inexpensive; builds soil fertility; easily integrated with other livestock grazing enterprises; niche marketing opportunities
Disadvantages:	More labor intensive than day-range; bird stress may increase with daily moves and exposure to temperature extremes

Birds and Performance. Joel Salatin raises broilers and layers using the daily move pen system. He purchases day-old chicks from a reputable hatchery. For broilers he uses the Cornish Cross, saying that, despite their problems, the Cornish Cross birds do well with the pasture-pen model because they do not have to roam more than 12 feet during pen movement or for fresh foraging material. All of the chicken breeds described in the day-range pasture system should do equally well using Joel Salatin's daily move pens.

Pasture. By "fencing the birds, not the pasture" and moving pens daily, Salatin raises up to 1,000 chickens on one acre of pasture. If you are just establishing pastures, your first consideration should be topography. The daily move model relies on moving shelters daily. You won't want to haul shelters over rolling hills nor will you want your birds sitting in low lying, damp areas. Design pastures so that they have an eight-week resting period or longer for chickens and at least a two-year resting period when pasturing turkeys. Coccidia can survive eight weeks in the field and other pathogens can survive longer (Manitoba Agriculture and Food, 2002).

In response to criticism that daily pen movement is too labor intensive, Salatin claims "you simply cannot get the level of health and forage utilization without the [daily move] pen." He recommends maintaining pasture grasses at a height of 2 to 4 inches. He suggests mowing ahead of the pens or, preferably, introducing other grazing animals ahead of the flock to achieve the desired pasture height. It is not necessary to allow a rest period between livestock grazing and the flock—there should be enough good forage left over for the birds.

Housing. Salatin designed three pasture housing alternatives to accommodate brooders, broilers, and layer hens. The brooder house is a semi-permanent structure, while the broiler pens and layer pens are both designed for daily movement. Salatin constructs all of his huts and pens with simple, inexpensive materials: pressure-treated lumber, aluminum (corrugated) roofing, plywood, and chicken mesh/wire. The descriptions below are what we call "classic"

PASTURE: DAILY MOVE PENS

Salatin-style housing and come directly from his book: *Pastured Poultry Profits*. See the book for photos and details. Other growers have modified the original Salatin-style pens over the years to accommodate climates, flock sizes, and other factors. The modified pens may be larger in size, have permanent wheels, or be designed to be moved with a tractor.

This daily pen was used by Frank and Kay Jones when they first started pasturing poultry. Pens were moved several times a day.

Brooder huts. Salatin recommends brooding birds on pasture and exposing them to cool temperatures at three weeks of age in order to develop hardiness. He constructs semi-permanent brooder huts to accommodate 250 to 300 birds. If raising more than 300 birds at a time and using a large brooder hut or pen, Salatin recommends partitioning off the birds into the smaller groups. He also uses temporary, 18-inch high plywood partitions within the brooder space to confine the birds tightly during the first week. This temporary partition is gradually moved to open up more room for each group of chicks until birds are ready to go out on pasture.

Each brooder hut or section is 8 ft by 10 ft with an 18-inch high, floorless bottom that is predator-proof and draft-proof. The huts have peaked roofs and are sided with chicken mesh to allow ventilation and natural light. Huts are deeply bedded with 4 to 8 inches of litter material. And, for those of you who dread cleaning out the brooder house in between batches, you'll appreciate Salatin's next bit of advice: don't clean out bedding between groups! He does not sanitize housing and instead leaves old litter to compost and create heat for the new batch of chicks.

Compost alone will not create enough heat for young chicks, and you will need to use an artificial heat source, such as warming lights. As with any other management system, the brooder huts must be maintained at the proper temperature during hatchlings' first few weeks.

Broiler pens. Broiler pens are arranged in a wing or "V" formation on pasture to prevent the creation of alleys in between houses. Each pen, built to house 75 to 100 broilers, measures 10 ft by 12 ft by 2 ft and weighs approximately 200 pounds. The floorless pen frame is constructed from one-by-three boards and reinforced with diagonal braces. Most of the walls are made from chicken wire mesh, although the back is made from aluminum roofing material.

The roof is flat and divided into two panels. One panel is made from aluminum roofing material and permanently attached to the pen. The second panel is removable and made from the same aluminum material as well as chicken wire mesh to provide ventilation during hot days.

The flat roof design makes the pen wind-resistant (that is, it is less likely to blow away) and the removable panels or hatches provide easy access to the birds when adding feed and water. The 2 ft wall height is low enough to step over, but tall enough to prevent broilers from flying out. If you plan to raise anything other than the Cornish Cross broilers (such as traditional breeds, turkeys, and waterfowl) you may have to modify the design to prevent the birds from escaping (Plamondon, 2003). For detailed design and construction instructions, see Joel Salatin's *Pastured Poultry Profits*.

Problems noted by those who have used the Salatin pens include:

- Low roofs can trap heat and kill birds
- Birds crowd in corners for shade (can cause suffocation)
- Messy pens due to overstocking
- Non-uniform bird sizes result from uneven foraging

Recommended modifications to make pen movement easier and to create more shade for the birds include covering the entire roof to create more shade, adding wings that close at night for protection, raising the roof to three or even four feet to increase air flow, and adding wheels to make the pen easier to move (Lee and Foreman, 2002). Another common design modification involves shrinking the pens to accommodate small flocks. If you do so, be sure to provide adequate pen space, particularly during hot summers, since the pens don't have fans or other reliable ventilation (Manitoba Agriculture and Food, 2002).

Layer pens and the "eggmobile." Salatin has successfully retrofitted his broiler pens to accommodate laying flocks by adding nesting boxes and modifying the roof to make egg collection possible. The nesting boxes are 1 ft by 1 ft by 1 ft each, made from pressure-treated lumber and the boxes are filled with nesting material. A 3- to 4-inch tall board across the front of the boxes prevents bedding loss when hens scratch. All of the boxes hang from one 6-ft piece of lumber that attaches to the back of the pen under the enclosed roof. Salatin stocks the same 10 ft by 12 ft by 2 ft pens with 40 to 50 hens (2.5 square feet per bird). Salatin also developed what he calls the "eggmobile" — a larger, sturdier, portable hen house for use on pasture. The eggmobile is 12 ft by 20 ft and accommodates 100 hens (2.5 square feet per bird). It is equipped with nesting boxes, feed trays, and waterers. Birds have unlimited access to range (they are free-range) and the house is moved every two to three days behind a cattle herd.

Turkey pens. Turkeys can be successfully grown and finished on pasture using the Salatin-style daily move pens. One producer who uses the Salatin method for his turkeys has found that the 10 ft by 12 ft by 2 ft pens allow adequate space and foraging material for about 30 turkeys. This same grower experimented with taller pens to accommodate the bigger birds, but found 3-ft high pens too cumbersome to move and noted that turkeys do as well (and become a little more "subservient") in 2-ft high pens.

Feed and Water. Salatin's feeding regimen for brooders, broilers, and layers is described below.

Brooders. Salatin encourages baby chicks to develop their foraging skills early on by supplementing high protein feed (which he formulates and mixes on the farm) with fresh grass clippings, dandelion blossoms, ragweed seeds, or vegetable matter in season. Chicks are given access to these fresh greens for only 10 to 20 minutes to prevent overconsumption of what Salatin calls "low octane" feed. He also feeds creek sand and aggregate to introduce silica and grit, rather than commercially manufactured grit. By feeding sand and aggregate, which contain bits of roots and bugs, along with hay chaff, Salatin says the chicks learn to scratch in search of food while consuming a diversity of minerals. Linear feeders and waterers are used. Salatin advises providing enough feed and water space to accommodate 35 to 50 percent of the flock at one time.

Broilers. More than 80 percent of Salatin's prepared feed consists of corn and roasted soybeans. Roasting is said to preserve the natural fat and oil content of the beans and more important, is necessary to destroy anti-nutritional compounds. In addition, Salatin feeds crimped oats, fishmeal, kelp meal, feed grade limestone (calcium), and Fertrell's "Nutri-Balancer." By adding the balancer to his ration, Salatin says the birds taste better, gain well, and produce a more balanced manure that is good for pasture quality (see **Resources** under *Feed and Diet* and *Suppliers*).

During the grow-out stage of production, linear feeders are still used, but white five-gallon buckets and hanging bell waterers are introduced. The buckets are placed on the roofs of each pen and gravity-filled from large water tanks that Salatin mounts on a trailer. The five-gallon buckets in turn serve as reservoirs for the bell waterers. Salatin restricts feed and water for a few minutes immediately after moving the pens to encourage foraging on the fresh pasture.

Laying Hens. Layers are more aggressive foragers than broilers and, according to Salatin, will consume at least 30 percent of their diet from grasses, legumes, and insects when turned out on pasture. While on pasture, Salatin feeds his hens whole grains as well as a calcium supplement for strong eggshell production.

NCAT Poultry Program Specialist Anne Fanatico cautions that birds managed under the Salatin system may not be able to forage sufficient insects for protein, and therefore you may want to purchase a complete, well-balanced ration for the flock (Fanatico, 1998).

Equipment and Supplies. Most of the equipment needed to manage birds using the daily move pen system can be found at your local hardware and poultry supply stores (see Figure 31). The only "special" piece of equipment you'll need is a homemade dolly for moving pens (see the Pasture Logistics chapter in Salatin's *Pastured Poultry Profits* for construction details).

Figure 31: Equipment Checklist – Salatin Pasture

- ✔ Truck and drums for hauling water to fields
- ✔ Pasture pens (plywood, aluminum roofing material, 1" chicken mesh/wire)
- ✔ Dolly (for moving pens)
- ✔ Feed trays
- ✔ Hanging bell waterers
- ✔ Five-gallon buckets
- ✔ Plastic tubing
- ✔ Brooder lamps
- ✔ Electrical cord
- ✔ Hanging nesting boxes (pressure treated lumber)
- ✔ Nesting material
- ✔ Feed
- ✔ Mineral supplements

Health and Welfare. Salatin believes in a "natural" approach to bird health and welfare. He does not use vaccinations or antibiotics, but encourages natural disease resistance and behavior through early exposure to fresh air, natural light, pasture greens, and the molds and fungi that develop in composting bedding. He believes small group size will promote birds' natural flock behavior and that not trimming beaks will encourage foraging.

Salatin's brooders average one to two percent mortality within the first week. Broiler flocks average less than five percent mortality on pasture. Cannibalism is virtually nonexistent among his flocks because, he believes, the birds' diet is well balanced and they have plenty of foraging to keep them busy. Remember that Joel Salatin is an experienced producer who has perfected the pasture pen model on his farm. If you're just starting out, mortality rates can be considerably higher.

The main health concern for Salatin's birds is the weather. Salatin has lost mature birds due to extreme heat. He recommends propping up the backside of pens during early afternoon to create additional airflow on hot days. Heavy rain can "turn depressions into ponds." Therefore, Salatin recommends monitoring birds, particularly chicks on pasture, to make sure their housing is relatively dry. It may be necessary to add bedding material, such as "hay pads" in brooder houses to get birds off the wet ground or to turn shelters away from the prevailing winds and rain.

Labor. Daily chores during the pasture season include feeding, watering, moving pens, and monitoring birds. Feeding and watering take Salatin about one hour for 26 pens (2,400 birds). Daily pen movement is the reason that the daily move pen management model is often labeled more "labor intensive" than other pasture-based systems. Salatin estimates that the task of moving pens takes up to one minute/pen. He moves 26 pens (2,400 birds) in approximately 30 minutes. The pens are designed to be moved by hand using a specially-designed dolly placed at one end of the 10 ft by 12 ft pen and lifted by a handle on the other end. After removing feeders and waterers, Salatin drags the pen to the new pasture section. The birds walk on the ground (inside the pen) as the trailing edge of the pen pushes them forward. See Figure 32 for a full estimate of labor required to produce birds in the daily move pen system.

Figure 32: Minutes Required per Bird Each Season* for Pastured Poultry Production

ACTIVITY	200 BIRDS/WK	400 BIRDS/WK	600 BIRDS/WK
Chick pickup at post office	.35	.17	.12
Brooding	1.21	1.21	1.21
Chicken move to pasture	.30	.23	.20
Brooder prep	.35	.22	.17
Pasture grow-out	3.63	3.03	2.83
Chicken pickup for processing	.45	.30	.25
Delivery to processing plant	1.38	.87	.69
Building projects	.23	.23	.15
Repair and maintenance	.35	.35	.23
Total minutes/bird (may not add due to rounding)	8.22	8.22	5.85
Total hours per season	715	1119	1522

**season = 26 weeks*
Source: Neufeld, 2002.

Finances. The full title of Joel Salatin's book is P*astured Poultry Profits: Net $25,000 in Six Months on 20 Acres*. Indeed, some growers have been able to make this kind of income on a small scale thanks to reduced input expenses and efficient management. Feed, labor, and housing costs are responsible for savings on the expense side. Salatin estimates that producers who rotate broilers and layers daily to fresh pasture (while confined to the pens) can reduce feed costs by 30 percent (Plamondon, 2003).

See *Growing Your Range Poultry Business: An Entrepreneur's Toolbox* for a 1,000-bird pasture pen enterprise budget and *Consumer Preferences for Organic/Free-Range Chicken* by Liz Neufeld for sample pasture pen budgets (see **Resources** under *Budgeting, Enterprise Planning and Recordkeeping*).

Summary. The daily move pen model is an alternative that may be most suitable for beginners who want to make a minimal capital investment or for smaller scale operations that have land available for pasture. This model requires minimal labor when compared with the "industrial," "traditional," and "organic" models. It encourages birds' natural foraging activity while allowing producers to take advantage of niche market opportunities for "pastured" products. In Salatin's words: "I cannot overemphasize the value of the pen to the smooth running of the pastured poultry model. It answers the need for small flock grouping, sanitary conditions, fresh forage, proper manure management, and predator control. It is also far cheaper and simpler to maintain than a stationary house of equal square footage."

Jeff and Beverly Berens, Uphill Farms
Holland, Michigan

There's a Market for Broilers Raised on Pasture

Many farmers remember "Mom's egg money" from back in the days before farmstead chicken flocks virtually disappeared. Well, those flocks are coming back. And, hard to believe, Mom's egg money can be 50 bucks a day. It's the same story for broilers. When raised with access to the out-of-doors, they sell for about $7 each, which adds up if you raise a few batches each summer. The same is true for turkeys. While turkey is selling in the supermarket for 69 cents a pound, a range-reared bird brings $2.25 a pound.

At the small farm of Jeff and Beverly Berens near Holland, Michigan, the family works to make extra money and create an attractive lifestyle on 40 acres of land. The land is well-suited for cash crops and they have rented it out in the past, but they prefer to use the land to develop their own enterprises without investing in tractors and expensive field equipment. They've settled on pasturing. One August evening, pasture walkers—mostly sheep, dairy, and beef producers—visited their farm to see something of the opportunity offered by pasturing nonruminant creatures like broilers, laying hens, and turkeys. The laying hens and turkeys are raised in a free-range system and the broilers in cages on wheels moved every day or oftener, the system popularized by Virginia farmer Joel Salatin.

Bev Berens estimates that chickens can get about a quarter of their feed needs from pasture, if you choose breeds that are "grazers and diggers," as she calls them. They still need a high-protein, high-energy grain ration. But it's really not the feed that makes the difference. It's the whole issue of how they're raised and how customers react to that. It's really about marketing. Grass-fed animals and animal products are said to be high in omega-3 fatty acids—the good ones—and low in omega-6 acids—the bad ones. That fact, and the fact that the Berenses use no antibiotics or growth promotants, are marketing tools.

Broilers

The Berenses have been producing about 1,000 broilers each summer, using the system developed by Joel Salatin. They raise one batch every seven weeks, raising the broilers in cages built on wheels they move each day across a pasture. About 75 birds are confined in a cage made of chicken wire and measuring about 12 feet square and three feet high. The sides are open, the top covered to provide shade. The birds follow beef animals, pecking through the droppings and eating flies and larvae as well as grasshoppers and other insects. But they must be fed grain and given water, and that requires the labor of moving both into the pasture.

On the plus side, Jeff and Bev can charge $1.90 a pound for the dressed chickens, which is well above the store price for chicken. They have an area under a roof, open at the sides, in which they process the presold broilers. It is equipped with killing cones, a scalder, a feather plucker, and eviscerating tables. The dressed birds are cooled in vats of ice water and bagged for customers who are told when to come to pick them up, usually the day after slaughter. This system requires that the birds be preordered, and Bev feels that this is a weakness in their current marketing. It's not easy to line up customers to order birds for delivery six weeks down the road, so there is always the potential for uncontracted birds. They have consulted and worked with the local Michigan Department of Agriculture inspector to ensure that they are meeting state requirements; still Bev is looking for alternative ways to process and market their broilers.

The Berenses would like to diversify and expand sales. Bev hopes to add vegetables and start a CSA. She wants to work with other CSAs by providing them with eggs. She wants to find other small farmers who want to raise broilers for her to sell through her sales network.

Marketing takes time. Bev maintains a mailing list and sends mailings and a newsletter to customers. Their Uphill Farm is listed on the www.eatwild.com website, which touts the benefits of eating products from animals raised on grass. Bev likes the Kalamazoo Farmers' Market, and could attend all three days a week it's open instead of just one. They are also in the process of developing a web site, www.uphill-farms.com, to use as a marketing tool.

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Since they were interviewed for this profile, the Berenses lost their land base for their poultry operation. Bev emphasized that their operation was successful, and thinks their system was a great way for them to raise and market poultry. She still gets about a call a week asking if they have broilers for sale. They would like to relocate, start a grass-based dairy operation, and likely have chickens as an additional enterprise.

Organic Management: Pasture and Semi-confinement

Organic poultry production is exploding. "Every category of certified organic poultry showed a surge in growth between 1997 and 2001," reported the USDA Economic Research Service (ERS) in a 2003 report. The number of certified organic layers, for instance, climbed from 537,826 birds in 1997 to 1.6 million hens in 2001. The number of certified organic broilers grew more than 85 times—from 38,285 birds in 1997 to 3.29 million birds in 2001. It's the same story for turkeys. In 1997, the growers reported only 750 certified birds. By 2001, ERS estimates that there were more than 98,000 certified organic turkeys being raised by U.S. growers (Greene and Kremen, 2003). Growth of organic poultry farming in Michigan, Minnesota, and Wisconsin was equally staggering over the same period (see Figure 33).

Figure 33: Certified Organic Poultry by State

	YEAR	LAYER HENS	BROILERS	TURKEYS
MICHIGAN	1997	40	900	None reported
	2001	52,335	1,132	9
MINNESOTA	1997	8,006	None reported	None reported
	2001	18,678	1,800	None reported
WISCONSIN	1997	590	3,500	None reported
	2001	15,687	25,733	8,069

Source: USDA, Economic Research Service, 1997 and 2001.

Formal ERS research combined with anecdotal evidence suggests that this growth in certified organic poultry production will continue. Thanks to the long-awaited establishment of the USDA National Organic Program (NOP) in October 2002, consumer confidence in certified organic products is expected to encourage further organic production. National Organic Standards dictate how broilers, layers, and other poultry must be managed under an organic system.

Poultry are not required to have access to pasture, but must be given freedom to exercise, access to fresh air, and exposure to direct sunlight. In Minnesota, Michigan, and Wisconsin, where winter weather can be severe, "inclement weather" exceptions permit temporary confinement (Behar, 2004). Temporary confinement is also permitted to "accommodate the needs of a particular stage of production" such as brooding. For these reasons, it's typical for an organic producer to pasture birds and/or to house them in semi-confinement and temporary confinement (NCAT, 2004).

All producers who seek organic certification must create their own "Organic System Plan" describing how they will comply with the national rules and how they will manage the flock, house and feed birds, handle waste, preserve flock health and welfare, and maintain records. For a detailed description of organic system plans and what is required, see *NCAT's Organic Livestock Workbook — A Guide to Sustainable and Allowed Practices Systems* prepared by the National Center for Appropriate Technology (NCAT). Much of the information presented below comes from this excellent resource (see **Resources** under *Organic*).

Organic Management Overview

Birds:	Conventional day-old chicks, all species and breeds
Land:	Outdoor access (land must be organic)
Housing:	Semi-confinement or pasture
Stocking density:	Sufficient room for natural behavior
Equipment:	Electric fencing, poultry netting, feed troughs, water fountains
Labor:	Recordkeeping, communicating with customers, plus flock labor as outlined for other management systems
Operation:	Year-round
Advantages:	Market premiums for products; environmentally friendly; endorsed by animal welfare advocates
Disadvantages:	Recordkeeping; regulated management practices; higher feed costs

Birds and Performance. Organic managers who do not breed and hatch their own chicks may purchase day-old birds from conventional breeding stock. Only day-old chicks are exempted from organic certification; if you're anxious to get your laying flock started, and wish to purchase pullets or other immature birds, they will have to be certified organic. Some hatcheries do rear birds from organic breeding stock out of principle. Coon Creek Family Farm in Mondovi, Wisconsin, for example, has a small breeding flock of pasture-reared organic CornDel broilers. The hatchlings are not certified organic, but come from parent stock that is fed an organic ration. Coon Creek Family Farm is listed in **Resources** under *Hatcheries*.

Regardless of where you purchase your birds, breed selection will be vitally important under the organic management system. National Organic Standards prohibit the use of conventional medicines and treatments unless the birds' welfare is at risk. For this reason, organic producers are beginning to search for hardy breeds that are more disease resistant and weather tolerant. Some growers have used the Kosher King chicken for broiler production, though on-farm trials have not shown them to be any better than the standard Cornish Cross for pasture-based organic production (Franczyk, 2002).

Pasture. According to the National Organic Standards, poultry producers seeking organic certification must provide their flocks with "living conditions which accommodate the health and natural behavior of animals" (Section 205.239, *Livestock Living Conditions*. National Organic Program, USDA). For some, this signifies access to well-managed pasture, while for others, this means a simple yard where birds can scratch in the sunlight. In truth, the NOP language is somewhat vague and subject to interpretation by certifiers. Cate Irsfeld-Eddy, a certification staff member with the Midwest Organic Services Association (MOSA) in Wisconsin, interprets the NOP language to mean:

- Pasturing is NOP-compliant but not required.
- Outdoor access yards with minimum plant cover are NOP-compliant.
- Outdoor cement yards are **not** NOP-compliant.

Although the NOP rules do not require poultry (including waterfowl and captive wild game birds) to forage on pasture, many organic poultry farmers turn their birds out on pasture for six months or more each year. They argue that this type of outdoor access more closely mimics birds' natural behavior than would time spent in an enclosed dirt yard.

If your organic plan includes the use of pasture or range for your birds, you will need to follow the National Organic Standards for pasture seeding and maintenance. The standards state that you must use certified organic seed (where available) and "approved practices or materials" to control weeds. Consult section 205.206 in the National Organic Standards for the list of approved fertilizer, weed and pest control practices and materials.

Be aware that organic buyers may have their own interpretation of the national regulations or may require additional management guidelines. Organic Valley™ Family of Farms, headquartered in Wisconsin, is one example. This farmer-owned cooperative has developed minimum plant cover requirements for outdoor poultry areas in addition to indoor and outdoor stocking density limits, and minimum feeder, waterer, and nest box numbers/sizes.

We strongly recommend that you check with organic certifiers and buyers before designing and establishing outdoor areas.

Housing. To comply with National Organic Standards concerning living conditions, housing must be designed so that animals can:

- Exercise
- Escape extreme or inclement weather
- Breath fresh air
- Practice "comfort" and grooming behaviors
- Move without risk of injury

It's possible to achieve these standards on pasture or in semi-confinement. In fact, it is not uncommon for organic growers to house their birds in semi-confinement (see Farm Profile: "Traditional" Doesn't Mean "Old-fashioned" on the Dickel Farm) or temporary, full confinement during inclement weather or a particular stage of production. Organic shelters must be equipped with adequate access doors or "pop holes" so that birds can get out during good weather to a yard or pasture. And while some buyers may have stocking density and nest box requirements, the National Organic Standards do not prescribe minimum stocking rates (number of square feet per bird).

Organic Inspector Harriet Behar, who lives and farms in Wisconsin, recommends that flock owners who have a large or long house (on pasture or in a yard) outfit it with many doors leading outside because one door for a few thousand birds is not enough to give outside access (Behar, 2004). If you genuinely attempt to provide outdoor access for your birds by constructing houses and shelters appropriately, you should have nothing to worry about when it comes to certification. Always check with your certifier before construction to make sure you are building something that is certifiable.

When it comes to layers, you must also consider lighting. According to the National Center for Appropriate Technology (NCAT), National Organic Standards do not include guidelines for artificial lighting or access to natural light and dark cycles. If you are thinking about the use of artificial lighting to induce molts and hence control the production of your laying flock, check first with your local certifier to learn what is allowable. NCAT warns that "the stress caused by this practice [of induced molting] might be viewed as inhumane by some organic certifiers and thus not permitted" (NCAT, 2004).

One final housing consideration (for all stages of production) concerns the use of cleaning products. It is standard practice to disinfect broiler and layer houses in between flocks to prevent the build up of pathogens. If you intend to seek organic certification, be sure to check the NOP National List of Allowed and Prohibited Substances for allowable cleaning, disinfecting, and sanitizing products. This national list can be found on the NOP website www.ams.usda.gov/NOP/NationalList/ListHome.html under "Processing Materials Decisions." The Organic Materials Review Institute (OMRI) screens products for compatibility with National List requirements. You can view the "OMRI Brand Name Products List" at www.omri.org.

Feed and Water. All feed must be certified organic, and poultry may not consume animal by-products. Rations may contain feed supplements and minerals where needed. A limited number of synthetic substances are allowed for use in organic livestock production (see Section 205.603 of the National Organic Standards).

In accordance with the National Organic Standards, producers who wish to become certified organic must begin using certified organic feed and acceptable supplements for all poultry from the time their birds are two days old. This means that you can purchase conventionally bred day-old chicks from the local hatchery but must begin feeding certified organic feed ration (either mixed on your own farm or purchased as a complete feed) the day they arrive. If you choose to mix your own feed, be sure to consult the NOP National List of Allowed and Prohibited Substances and carefully research inputs. Fishmeal supplements, for example, a traditional source of concentrated protein among organic producers, are an allowed substance. However, fishmeal supplements are almost always preserved with ethoxyquin and fishmeal supplements preserved with ethoxyquin are prohibited (Mattocks, 2002). A new fishmeal supplement preserved with "Naturox", an all-natural preservative comprised of vitamin E, rosemary extract, and citric acid, is available (Mattocks, Fertrell Company, personal communication, 2004) (see **Resources** under *Feed and Diet*).

Farmers seeking organic certification are often scared off by stories they hear about organic feed shortages and prices. The USDA Agricultural Marketing Service surveyed feed suppliers in 2002-2003 and found out that:

- There does not appear to be a shortage of organic feed in the Midwest market; and
- Organic feed prices (for a 2:1 corn/soybean ratio) are 1.5 to 2 times higher than conventional prices in Michigan, Minnesota, and Wisconsin (USDA, Agricultural Marketing Services, 2003).

In the Midwest, several feed suppliers offer organic poultry products. See **Resources** under *Feed and Diet* and *Suppliers* for lists of organic feed suppliers.

Equipment and Supplies. If you plan to raise birds organically, you'll need the same equipment used by other poultry growers (see Figure 34). The National Organic Standards govern many supplies such as cleaning agents.

Figure 34: Equipment Checklist – Organic Management

✔ Feeders	✔ Artificial lights (if certifier allows)
✔ Waterers	✔ Electric fencing (if on pasture)
✔ Litter/bedding	✔ NOP-approved cleansers
✔ Nesting boxes	✔ Organically certified seed (if on pasture)

One source of supplier information comes from the Organic Materials Review Institute (OMRI). OMRI maintains an ongoing "Brand Name Products List" for organic livestock production, processing, and handling. Although the list is not comprehensive (suppliers must pay to have their products reviewed and listed), it continues to grow and is well respected in the organic industry. Although all products listed are screened by OMRI for compliance with the national organic standards, it is crucial that you check with your certifier to determine whether its use is allowed. The list is available on the Internet at www.omri.org or by contacting OMRI directly (see **Resources** under *Agencies and Organizations*).

The Midwest Organic and Sustainable Education Service (MOSES) also publishes an annual directory of organic feed, seed, and equipment suppliers (see **Resources** under *Agencies and Organizations*).

Health and Welfare. In accordance with the National Organic Standards, poultry growers are responsible for ensuring the health of their flocks by: (1) designing housing and feeding areas so as to prevent predation and injury; and (2) developing an organically acceptable plan for preventing and treating disease.

Your plan for preventing disease and other illness can include sanitizing incubators, disinfecting brooder houses, and using a nutritionally balanced feed. Routine vaccinations are permitted as a preventive measure against common avian diseases such as Marek's, Newcastle, and coccidiosis.

In the event that your birds become sick or injured, organic certifiers encourage the use of "alternative medicine" for treatment, since the majority of conventional medicines are not allowed under the National Organic Standards. As noted by NCAT specialists, however, farmers' expertise in using alternative medicines is limited. When there is no other recourse, antibiotics and other conventional treatments are required to preserve the health of the sick or injured bird. In such instances, the treated bird(s) may never be marketed as "organic" and the birds must be physically identified as "nonorganic" using bands or by separation from organic birds.

NCAT suggests finding a veterinarian who shares or supports your interest in organic production. "With such a vet as your … partner, it is much easier to develop treatment strategies that are holistic and NOP compliant, and that avoid the accidental use of prohibited medicines when suitable alternatives are available" (NCAT, 2004).

A comprehensive resource for alternative poultry medicine and practices is *Remedies for Health Problems of the Organic Laying Flock*. This compendium addresses preventive care and health concerns using nutritional management and herbal and homeopathic remedies. *The Chicken Health Handbook* by Gail Damerow describes how pathogens and parasites are spread—information that can aid you in developing preventive disease strategies. Damerow also makes recommendations for preventive measures (by stage of production) and treatment (mostly conventional) (see **Resources** under *Poultry Health and Welfare*).

Labor. Due to recordkeeping requirements, organic poultry production may be the most labor intensive of all management systems. Recordkeeping is critical to ensure organic integrity and traceability. The National Organic Standards do not explicitly state the type and number of records required; this will depend on the complexity of your operation and on your certifier. Most organic growers maintain some or all of the following records:

- Pasture maps with pen numbers and/or rangeland units
- Accurate history sheets for fields, pastures, and breeding stock
- Soil and water test reports
- Verification of the organic status of chicks (if applicable), pullets, feed, seeds, and other purchases
- Documentation of efforts to procure organic inputs (when not used)
- Forage crop pest and disease monitoring reports
- Production logs and activity reports
- Flock health records: vaccination dates, mortalities, etc.
- Labels from vaccines and any other medications or health inputs (electrolytes)
- Breeding records
- Labels from sanitizers and cleansers
- Labels from purchased feed and feed supplements
- Equipment, storage, and housing cleanout logs
- Slaughter and processing records or verification of organic certification of slaughter facilities
- Sales receipts or invoices
- Sales records

Talk with other organic poultry growers—find out how much time they spend tracking feed and supplements used, recording paddock rotations, and generally preparing for their meetings with certifiers.

Finances. As with the other production management systems, feed is the biggest poultry enterprise expense you'll have when going organic. Certified organic poultry feed prices are often 1.5 to 2 times that of the conventional feed. You may be able to reduce feed costs and other expenses by purchasing in bulk, either independently or as part of a cooperative.

In *Growing Your Range Poultry Business: An Entrepreneur's Toolbox* (see **Resources** under *Budgeting, Enterprise Planning and Recordkeeping*) you'll find sample production budgets for three organic models (mobile, fixed hoop, and stationary) at various flock sizes. Remember these are just estimates, and costs may differ for your area—use them as a reference when developing your own enterprise budget.

Once you have an enterprise budget, carefully weigh the higher cost of feed, pullets, and other items against any market premiums you may be able to charge for certified organic poultry products. Calculate your break-even to learn how much you can afford to pay for feed and other inputs as well as what price you must charge for your birds in the marketplace.

Summary

Organic production is a good choice for those who are looking to generate premiums from their poultry enterprise and who are interested in organic principals and don't mind a little extra recordkeeping.

If you are considering organic poultry production, take a good look at your values, goals, and markets. Call the National Center for Appropriate Technology for a free copy of *NCAT's Organic Livestock Workbook — A Guide to Sustainable and Allowed Practices* or ATTRA's *Organic Compliance Checklist for Producers*. Talk with several NOP-accredited certifiers to learn about organic production requirements and to decide if this management alternative makes the most sense for your family and your farm business. A list of certifiers accredited by the NOP is available at www.ams.usda.gov/nop. You can also contact your state department of agriculture for specific information about organic production requirements or certifiers operating in your state (see Figure 35).

Finally, remember that in order to be sold as organic, poultry must be processed organically. The availability of organic processing facilities is often the limiting factor for potential producers.

Figure 35: State Contacts for Organic Production

Michigan:	Colleen M. Collier, MI Department of Agriculture PO Box 30017, Lansing, MI 48909 (517) 373-0280 collierc@michigan.gov www.michigan.gov/mda
Minnesota:	Meg Moynihan, MN Department of Agriculture 625 N. Robert St., St. Paul, MN 55155 (651) 201-6616 meg.moynihan@state.mn.us www.mda.state.mn.us
Wisconsin:	Perry Brown, WI Department of Agriculture, Trade & Consumer Protection 2811 Agriculture Dr., PO Box 8911, Madison, WI 53708-8911 Perry.brown@datcp.state.wi.us www.datcp.state.wi.us

Ron, Mindy, Arthur and Derek Desens, Sleeping Cat Organic Farm
Litchfield, Minnesota

Sleeping Cat Organic Farm

The Desenses were interviewed in the spring/summer of 2004. Tragically, Ron died unexpectedly in the fall of 2004. His wife, Mindy, and sons, Arthur and Derek, graciously agreed to include the profile about their farm.

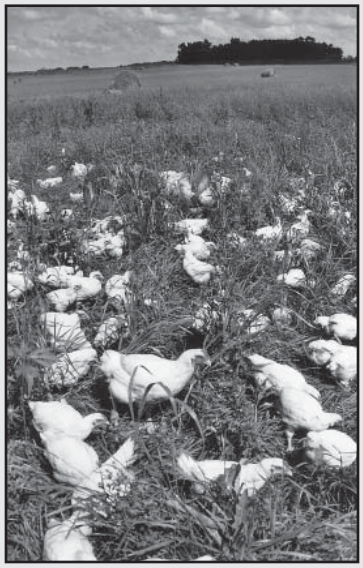
Background

"My family moved to this farm in 1924," said Ron Desens, a tall, slender man who spoke as quickly as he worked. Ron said they farmed "the old-fashioned way" until the 1950s when they switched to chemical agriculture. He moved away after college, but when his father retired from farming in 1980, Ron and his wife, Mindy, returned.

"When we came back to the farm, we noticed that conventional farming was creating an enormous amount of soil erosion," Ron said. The Desenses live in a region with rolling hills and silt-loam soil, a landscape susceptible to soil loss. They decided they would either farm in a manner good for their land or get out of farming altogether. In 1983, they converted to organic farming. Ron said that since converting the farm to organic production, he has noticed an improvement in the quality of the soil. "There's no more erosion," he states. He has a few minor problems with cattle paths, "but it's nothing that can't be solved."

Ron and Arthur Desens.

Ron, Mindy, and their sons, Arthur, age 24, and Derek, age 22, all contribute to the farm. Ron and Arthur handle farm operations, with Derek, a senior at the University of Minnesota-Morris, helping on weekends when he's available. Mindy also runs a travel agency, and both Ron and Mindy work night shifts at homes for the developmentally disabled. Ron figures that about a third of their income comes from the farm with the remainder coming from their off-farm jobs. Their off-farm jobs also provide important health insurance benefits.



Cornish Cross broilers on pasture.

Organic production

Although they began with mostly laying hens, for the past few years, they have slowly been building up broiler production. The Desenses use a standard breed of broiler, the Cornish Cross, but Arthur feels their broilers are "somewhat unique in that we don't butcher until 13 weeks of age. The result is chicken that is leaner with more texture. It's a roaster, not a fryer." One might assume these chickens would be huge after this much time, but "they're only about three to five pounds. If you give them room and restrict their feed, they will grow slower and remain much more active," Arthur said. The Desens have had good results from this method of raising chickens. Arthur states, "No leg problems and no instant heart attacks. If you give this breed unlimited access to feed, they'll eat continuously, become lethargic, and some percentage of them will drop over dead."

The Desenses use a day-range pasture production model for both their broilers and laying hens. The layers are in a shelter on skids that gets pulled with a tractor every three to five days; the broiler pens are moved daily. "We don't go through the hassle of constructing a fence around the coop—we let them run completely free," Arthur said. The broilers cover a smaller radius around the coop than layers. Arthur said, "The bulk of the chickens range from 50 to 100 feet from the coop. There are some that range 500 or more feet from the coop, which is pretty remarkable!"

Broilers are raised in batches of about 500 to 600 at a time. They initially lost a number of baby chicks to rats, so now keep a cat in the brooder—interestingly, the cats tend to leave the chicks alone.

The Desenses have not kept close tabs on the mortality of the chickens out on pasture, but don't have a big problem with predation. Loss to predators is a weakness of the day-range model of production since there is no net, or canopy, to protect the flock from airborne predators, such as hawks or owls. "I've actually been kind of surprised by [low predation losses]. Occasionally, we'll get a hawk that will pass through the area," Arthur said. Ron added, "It's during August when the young hawks are kicked out of their nests, then you have trouble." By October, hawks are no longer a problem. This year, the Desenses are starting the chickens early enough so they will have reached full growth by August.

The Desenses also use a video monitoring system that Arthur constructed to keep an eye on the flocks. "If we see them run for cover, we'll come out and chase the hawk away," said Arthur. Ron adds, "We haven't found the final solution to the predator problem, but we're working on it. The biggest predator problem you have is your dog," said Ron, "The second biggest predator problem you probably have is somebody else's dog."

Pasture management

The best way to characterize their production system is "grass organic," with most of their 300 acres in pasture. The hillsides are permanent pasture, but they seed much of the remaining pasture. They have a six-year crop rotation—soybeans in the first year, followed by oats and alfalfa with grass the second year, the third and fourth year hay, the fifth and sixth year pasture again. "So, we only plow once every six years. And that is only on land that is not highly erodable. We use grass as much as we can in our production," Ron said.

His ruminants are fed grass only, and the poultry get as much grass as possible. "The laying hens we want to have out on pasture as much as possible. We're building shelters that are sufficient for them to stay out there all winter."

Layers on pasture on the Desenes farm.

Layer shelter on skids that gets moved every three to five days.

Organic feed

The Desenses mix their own feed to supplement the grass-based diet. They raise their own soybeans and oats and have the soybeans extruded at a nearby certified organic facility. There are several organic farmers in the Litchfield area from whom they buy corn. Crab meal and calcium are added as mineral supplements. Ron said he tried buying prepared organic feed elsewhere, but the chickens didn't eat it as well.

About 30 to 40 percent of the chickens' diet comes from grass. By moving the pens at least 50 feet every day, the chickens get new pasture. Ron adds, "They eat grass. They eat the leaves right off of the alfalfa plant." Arthur adds, "The Cornish Cross chicken isn't as good at foraging for its own food as the standard laying breeds."

Other enterprises

The Desenses raised more than 60 geese in 2003. Because Ron has developed a list of people who frequent the farmer's market, he managed to sell all of the geese. The feedback they received was very positive. Geese eat more grass than chickens, ducks, or turkeys, so geese are cheaper to feed and have a very healthy meat. "Geese start eating grass from the day you get them," said Ron.

The Desenses only raise livestock products—beef, veal, chicken, and eggs at this time, but would like to add goats. They also plan to raise some turkeys this year, but since turkeys like to roam, they may have to find a way to confine birds.

Organic certification

The Desenses' farm has been operated organically since 1983. Presently, they are certified organic by the Organic Crop Improvement Association International (OCIA). Ron developed his organic plan for poultry over one winter. "I've raised chickens for over 20 years," he explains, "so there wasn't much to change, or add, when we certified our poultry." Once every year, the inspector arrives at their farm by appointment and reviews their records and operation. This usually involves viewing copies of labels from all feed supplements and inputs into their soil. The certifier wants verification that a seamless audit trail exists between the inputs to the farm and the product sold to customers.

Organic certified chicken packaged for market.

Chicks must be fed a certified organic ration until they are processed and packaged in a certified organic processing facility. Laying hens must meet these same criteria. Often, farms will buy "ready-to-lay" pullets from another producer. This supplier must be certified organic for the pullets, and subsequently the eggs they lay, to qualify as certified organic. All purchase and sales records of where one buys and sells poultry must be kept on hand for the inspector to review.

Ron spends about one-half hour per week maintaining his records for organic certification. "Grass-based production makes organic farming easy," stated Ron. "If one is considering conversion to organic production, this is the best way to operate your farm." The pastured poultry model of production reduces the amount of organic grain needed for feed, thus lowering the cost of production.


Ron with customer at Minneapolis Farmers' Market.

Marketing

The Desenses direct market to a list of customers they developed over the past 20 years. They also sell at farmers' markets, such as the Minneapolis Farmer's Market on Lyndale Avenue near downtown. "Most of our customers are quite loyal," states Ron. Although the Desenses now sell only frozen chickens for convenience reasons, they plan to market fresh chickens next year because, according to Arthur, fresh chickens are generally more popular.

"Marketing is very important," Arthur said, "you have to like to sell." Over the last twenty years, the Desenses have tried many different outlets for their farm goods. In addition to farmers' markets, they have met people at gas stations to distribute food when there weren't any markets open. Ron feels that they are selling themselves, not just the food. "We let people know that our farm is sustainable and we're not going to trash the resources. We set aside ten percent of our land as wilderness. If people are willing to pay a little more for our product, we'll keep producing … it's a social contract." He added, "We practice what we preach. We eat organic food while the best car we've got is probably worth $500. We spend thousands every year on organic food."

Summer 2007 Update
Arthur and Mindy no longer raise geese or turkeys. Trucking them up north for processing was too time-consuming. The roasting chickens are still raised using organic practices and are fully-free-range, but they are no longer certified organic, as the Desenses' meat processor decided to drop his organic certification.

Predation problems with the free-range birds varies widely—lately they've had quite a bit of trouble with foxes and coyotes. Hawks haven't been much of a problem.

All their marketing is through their two stalls at the Minneapolis Farmers' Market, every Saturday from April through December, and twice-monthly during the winter. They sold about 1,000 roasters in 2006, and plan for the about the same amount number in 2007. Mindy suspects they could sell more, even with the higher prices they have to charge to be profitable, given the increased cost of organic corn feed. Mindy said, "The demand for this fully-free-range chicken continues to grow. When people gawk at the price, we simply explain to them, 1: that our method of production costs far more per chicken than the industry standard, 2: we deal with quality, not quantity, and 3: even poor-dirt farmers deserve some kind of return on their labor. We say all this with a smile, of course. But we don't apologize for our prices or our products; we DO believe our chicken is the best!"

Explore Your Alternatives

Every system has its advantages and disadvantages. What works well for your neighbor may not be the best choice for you and your family. Similarly, you may find that a combination of the systems described above may work best. It's not uncommon to start out using one management alternative and modify along the way. In the real world, no management system is pure (see Farm Profile: Returning Chickens to the Range).

Your decision about which management system or *combination of systems* to employ will depend on your proximity to markets and processors; buyer preferences for how meat/eggs are produced; market competitors; other enterprises; management and marketing skills; available physical resources; financial opportunities; and of course, your goals.

The best way to learn more about a particular management system is to visit an operating farm. Don't be afraid to ask questions. Do a little reading and research on your own. Last, but not least, crunch some numbers to explore capital investments and annual expenses for the alternative(s) you're considering. Contact the Center for Integrated Agricultural Systems for a copy of the *Generic Poultry Enterprise Budget*. Use this worksheet to begin estimating your projected sales revenue, variable costs such as feed and birds, fixed costs for buildings and equipment, and labor and management costs. From there, you're ready to calculate net income from your poultry enterprise. And remember, your enterprise budget is only as good as the numbers you put into it. Make phone calls to hatcheries, feed mills, and other suppliers to obtain accurate expenses estimates. Several contacts are listed in **Resources** under *Feed and Diet, Hatcheries*, and *Suppliers*.

Mike and Debra Hansen, Gifts From the Good Earth Farm
Milladore, Wisconsin

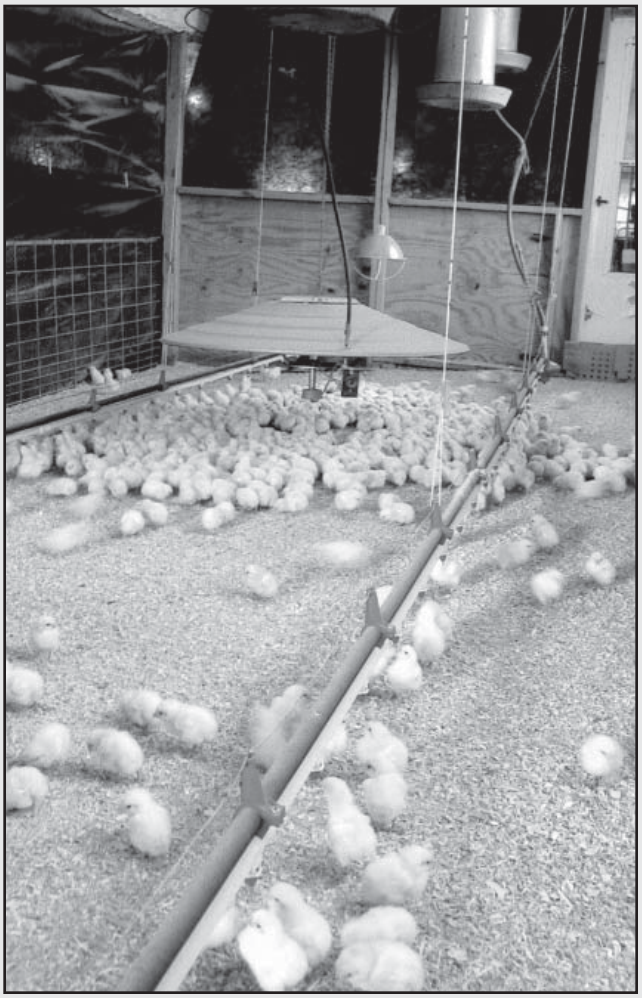
Returning Chickens to the Range

Despite not being raised on a farm, Mike Hansen feels he was born to be a full-time farmer. When he met his future wife, Debra, a dairy farmer's daughter, it was love at first sight. "I became absolutely infatuated with farming," Mike describes. The day after returning from their honeymoon in 1985, Mike was digging in the dirt of Debra's family farm.

But it has taken a long time for Mike to fulfill his destiny. For 14 years he worked office jobs while operating market gardens, raising chickens, and tending livestock on the side. In 1995 Mike and Debra purchased 76 acres in central Wisconsin, which they certified for organic production in 1998. They launched "Gifts From the Good Earth," which offers organic, pastured poultry, beef, and pork finished on intensively managed pastures. In 2002 they raised 4,600 broiler chickens, selling them through restaurants, groceries, on-farm purchases, and Internet orders, even as both Mike and Debra worked off the farm while raising three children.

Farming and working full time got to be too much for Mike, so the Hansens cut back to 1,200 chickens for 2003. But Mike wasn't giving up his dream. He decided to scale back to half time at his county rural planning job, and quit altogether late in the year. "It just got to the point where we knew I had to do it, because this really is our dream," Mike said.

In 2004 the Hansens aimed to grow and sell at least 4,000 organic, dressed chickens, along with 25 head of grass-fed beef and smaller numbers of turkeys and hogs. For the chickens Mike is developing brooder and pasture-growing systems that he believes can allow one person working half time to produce up to 20,000 birds annually. Even more important, Mike said, is the enterprise's effort to refine its marketing system to sell those birds to customers far removed from their isolated farm.



Day-old chicks gather under LP-fired brooders and drink from elevated water lines in a brooding room.

Starting chicks

The Hansens buy day-old, Cornish Cross chicks from a commercial hatchery starting no earlier than May 1. Mike converted a portion of an old dairy barn into a brooding pen capable of starting 1,200 chicks. The 12 ft by 30 ft area is bounded by wire hog panels covered with chicken wire. The pen is topped by netting to prevent sparrows and barn swallows from entering. Mike leaves the barn doors open during warm weather to allow for ventilation, but hangs lightweight cloth over the outer sides of the brooding area to control air movement through the pen and prevent the chicks from being startled when a barn cat walks by. The concrete floor is bedded with pine shavings.

For the new chicks, a portion of the pen is heated to above 90 degrees F by an LP gas-fired brooder. Temperature levels are decreased as the birds grow. They eat a starter ration

from hand-filled, hanging feeders, and water is provided through a pressure-regulated drip system. After the chickens are moved outside at three to four weeks of age, Mike swings the hog panels up, allowing him to shovel the bedding into a gutter. He tries to allow the pen to sit empty at least a few days between batches.

Mike said the brooding system has worked well and that death loss has averaged 10 percent. Daily chores for 1,200 chicks require no more than 15 minutes. He is considering adding similar brooders to the dairy barn as his business grows, but also fears disease problems. Another option would be developing skid-mounted pasture brooders that, after the heating units were removed, could double as portable growing facilities that would shelter the birds throughout their lives on the farm. "We wouldn't have to transfer the birds from brooder to pasture, and it would be cleaner because we could give the chicks access to the outdoors almost from the start," Mike said.

Pasture

The pasture production season starts in late May and ends in early October. The pasture chickens are kept on roughly one-third of the farm's 60 acres of pasture each year, with the production area in a three-year rotation. The birds provide fertility and insect control that are also important to the farm's expanding beef cow-calf grazing program. "I want to have a holistic farming system that is good for the earth and produces good quality food for my family and our customers," Mike explained. He said he needs to learn more about managing broilers, laying hens, turkeys, cattle, and hogs in a system that provides natural pasture fertility and parasite control.

Housing

Mike's first experience with pasture accommodations was with an 8 ft by 12 ft movable pen made with an oak frame and steel sides that he moved at least daily. "It weighed about 300 pounds, and it just about broke your back to move it," he recalls.

After some trial and error, he settled on pasture cages made of cattle and hog panels. Two 16-ft wire cattle panels are bowed over a pair of 2 ft by 4 ft frames spaced 12 feet apart. Hog panels are placed on the other two sides, with chicken wire preventing birds from escaping through gaps in the panel wires. About half of the side and roof area is covered with a tarp. Positioning the pens so that the tarp is to the windward side has prevented the hoop houses from being turned over in even the highest winds, Mike said. The structure, which weighs about 125 pounds and requires less than $100 in materials, can be moved by hand with a dolly.

The Hansens' pasture shelter consists of wire cattle panels covered with a tarp. It is designed to be moved to new pasture weekly, rather than daily.

Although this pen was easier to move than the wooden pens, Mike grew dissatisfied with the labor requirements and relatively poor growth performance with the cage production method. In 2002 he changed to a modified free-range system, enclosing the chickens within about 8,000 square feet bounded by electrified poultry netting. Mike positions five pasture cages within the enclosure, creating shelter and pasture for more than 1,000 birds. With the chicken wire removed, the birds are free to move to and from the structures by stepping through gaps in the wire panels. The netting and panel shelters are moved to a new area of pasture about once a week, although Mike also shifts the shelters a few feet every day or two to prevent manure buildup. Drinking water is piped from the farmstead to the pasture, with water

containers placed on low wagons that can be moved with the enclosure. Feed containers are placed in the shelters, and Mike also sprinkles some feed in the pasture to encourage pecking and grass consumption. He can tend a thousand birds in 10 or 15 minutes, with the weekly moves of the enclosure requiring about an hour. "We found that letting them run free improved their health and demeanor, and it's less labor by far," Mike said. The extra exercise may be slightly reducing weight gains, but grass consumption has increased. Mike asserts that dark meat quality has improved with the change. He said death losses on pasture have declined to less than five percent with the move to the free-range system, as the birds do not peck at each other nearly as much. Other than an occasional hawk attack, predators have not been a problem.

In early 2004 he was thinking about modifying the pasture cages to provide more shelter. One problem stems from the fact that the Cornish Cross meat chickens do not roost. "Right now they're on the ground, and they get wet and cold. I think that's costing us some weight gain," Mike explains. He envisions a structure elevated on skids with slotted plastic floors that could keep the birds warmer and drier. These structures could also serve as brooders, allowing the chickens to be associated with one building during their entire, eight-week life span on the farm. Mike believes that with proper management, the farm will be able to consistently keep death losses at five percent from arrival to departure.

Mike Hansen was building trailer cages capable of hauling 2,000 chickens on the four-hour trip to his processor.

Processing

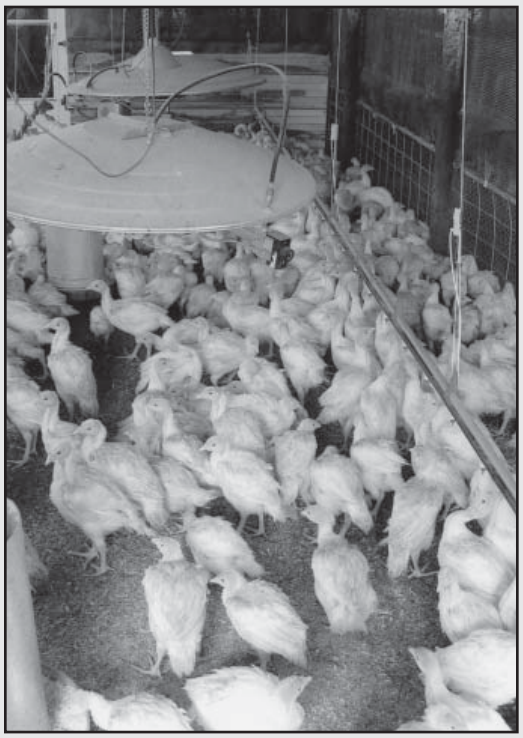
Mike takes his chickens to a USDA-inspected plant in northeastern Iowa. He built a trailer capable of hauling 1,200 birds housed in four-tier wire cages, and hauls them behind his pickup truck on the four-hour trip to the plant. The dressed chickens, which average about four pounds, are quick-frozen at the processing plant. Primarily because of liability concerns, Mike does not sell any fresh chicken. The farm has a freezer with a capacity of 1,500 dressed chickens, and any additional inventory is placed in rented cold storage space. Mike said it is important to have a year-round inventory to meet the needs of restaurant and grocery store customers. In early 2004 he purchased a different truck and was looking for a larger flatbed trailer to go with it. With redesigned transport pens, he plans on hauling up to 2,000 chickens to the processor.

Marketing

While Mike strongly believes that marketing holds the key to success for his poultry enterprise, he lamented the farm's "lackluster" performance in this area. "That has been the fault of working off the farm," he said. With Gifts From the Good Earth located in a rural area, efforts to market locally have not been very successful. Only about ten percent of marketing revenues come from on-farm sales, and the Hansens gave up on farmers' markets because of the time involved. They sell some chicken to a few natural foods stores in the area, but Mike does not like to spend time delivering product. "There are scattered people in rural Wisconsin who care about what they eat, but you have to get to the larger cities to make sales," he asserted.

Radio advertising drew very few customers. They developed a sales brochure that has brought in some business. Mike has gained several larger restaurant accounts. However, Internet sales to individuals through the Gifts From the Good Earth web site were producing more than 60 percent of the farm's revenues in early 2004. About 70 percent of total sales are shipped in dry ice via multi-day ground or overnight delivery services. "Our main focus is now on the web site," Mike said. "We're part of the 'new economy.' Our storefront is the world."

Mike designed his own shipping boxes by cutting two-inch thick polystyrene into panels that can be made into boxes capable of holding up to 12 dressed chickens. Each box requires about $4 in materials and 10 minutes to make. Mike reports very few problems with shipping products to both coasts, and even as far away as Guam. He dislikes the labor and mess involved with making the boxes and is working with a company that will be able to do the job for him. The farm can offer overnight ground delivery to Chicago and Minneapolis at a cost of $15 for a 30-lb. box. "Shipping can add 25 to 50 percent to the cost of small orders, even though we don't build any profit into the shipping," Mike said.



In addition to chickens, the Hansens grow turkeys in brooding areas constructed within an old dairy barn.

Mike said he wants to keep his prices within the reach of average families with kids. "We want to provide a reasonable price so that people like us can buy our products," he explains. "If I'm going to be successful at this, I have to produce the highest-quality product I can, and I have to get it to the customer at or near the price they see in the local store. At that point, the convenience of the delivery swings the sale our way."

In the late 1990s, the Hansens priced chicken at $1.79 a pound, plus shipping. But their calculations indicated production costs at $1.75/lb., a figure that includes depreciation, but not family labor. With a moderate salary figured in, the breakeven was closer to $2.35. "I called our customers and said that because the price wasn't sustainable, we were raising it. That day we sold 700 chickens," Mike describes. In early 2004, the standard price on the web site was $2.89/lb.

With a new, USDA-inspected locker plant scheduled to open nearby in 2004, the Hansens formed a limited liability corporation with a neighbor to operate an expanded pasture-raised, organic and "natural" beef business. They also plan to offer more pastured pork and sell more eggs. Gifts From the Good Earth counts about 250 customers, including about a hundred "regulars" who purchase products at least four or five times a year, Mike said. "The trick is to turn the other 150 into regular customers."

He is targeting the Chicago restaurant market, and envisions working with a warehouse that could provide central storage for several customers, thus limiting the number of delivery trips he'd need to make. Mike said his business may be capable of netting $80,000 per year in profits from chicken sales alone, with the other enterprises adding to that bottom line. He said hiring labor and contracting production to other farms are possibilities if such moves allow Gifts From the Good Earth to operate at a scale that allows Mike to continue with his goal of full-time farming.

Labor

"We're fanatical about labor efficiency. We constantly analyze how long it takes to do things," Mike explains. When he worked off the farm, Mike was able to handle chicken chores in both the brooder pen and the pasture cages in 25 minutes. He calculates that each chicken requires 3.5 minutes of work to raise, not counting marketing labor or work done on special farm projects. "I feel I can raise 5,000 birds without breaking a sweat," Mike said. If the markets for his chickens continue to grow, he figures it may be possible to raise 20,000 meat chickens a year with about half-time labor. "Our production model has been based on 20,000 birds a year since day one," he explained. Mike intends to spend more time on marketing and business management now that he is not working off the farm. "I'm spending three or four hours a day at the desk doing business work," he explained. "I'm the kind of person who loves having 12 things to do at one time. Not everyone is like that."

Finances

In 2003, the farm grossed about $40,000 from the equivalent of about one full-time labor unit. During their first nine years of operation, the Hansens grossed a total of about $120,000, and did not draw any money for family living. "We didn't want to risk everything by jumping in with both feet," he explained. "We wanted to slowly build something that was sustainable." Mike said he has to work harder at scaling up the business now that he is not working off the farm. He and Debra, an accountant, have put together a business plan that calls for growth and provides some family living from the farm. In a typical year, with no major death losses, Mike said the business can clear about $2 per bird above production costs to pay for family labor and management. He believes net profits in the $3-$4/bird range are possible with better production management at a larger scale.

An old dairy barn is home to chicks for the first four weeks until they are ready to go out on pasture.

Words of advice

Mike said his goal is to increase the size and efficiency of his business to give Debra the option of quitting her off-farm job. However, he urges poultry producers to start small. The Hansens began with 50 chickens, and did not reach 1,000 birds until several years later. Prospective producers should first study the market. "Get a feel for how many birds you can sell before you buy the chicks," Mike said. Even if there is large market potential, "don't produce more birds than you are comfortable raising." And, he added, "Never stop learning. Once we think we have a good idea implemented, we begin evaluating how we could have done it better."

Summer 2007 Update

It is certainly appropriate that Mike and Debra's Gifts from the Good Earth farm profile was called a "pasture and market transition" management system. They are constantly evaluating their production and marketing practices, and making changes.

In 2005 they teamed up with a group of Amish farmers who are certified organic and shared their commitment to animal welfare and quality products. As a team of eight farms marketing collaboratively, in 2006, they produced 11,000 chickens, 2,100 turkeys, 34 hogs, 20 lambs and 30 head of beef, all raised organically and on pasture. Good Earth Farms' products are available in select stores and restaurants in Wisconsin and Illinois, as well as directly from the farm's web site to individual customers.

"I needed someone to produce the same way we were, and they needed someone to market." Mike said. "We put together a grower's manual and fine-tuned it with the group's help… Right now we're limiting it to ten farms. If we find that markets far exceed what we can produce, I'd rather franchise this concept [than add more farms]. People want to buy from the farm—they want to talk to the farmers who produce their food."

After brooding, all birds are now raised on pasture, either enclosed by electric netting or loose, and are brought into the houses at night. They now use the Freedom Ranger breed rather than the Cornish Cross breed. Mike says that although the broilers are slower growing (ten weeks instead of eight) they've had have much better survival rates and fewer health problems. But for the first time this year, there's no poultry at the Hansen farm. All the birds are being raised by other members. "If I was going to do the marketing and the shipping, something had to give," Mike says. "I miss the turkeys. Their curiosity and mannerisms are endearing."

Portions of this profile update were taken with permission from "Farming As If Everything Matters", a chapter about Good Earth Farms in Renewing the Countryside: Wisconsin. 2007. Available from **Renewing the Countryside**, *www.renewingthecountryside.org.*

Select the Best Alternative

Rank the following marketing, processing and poultry management options with a score of 1 to 3 where 1 = no, 2 = somewhat, and 3 = yes. Add the numbers up and look for the alternative with the highest score. That alternative may make the most sense for you and your family. Get input from others who will be involved in the growing, managing, processing, and marketing of your flock, so that the choice you make has the support of those around you. We recommend contacting ATTRA for a copy of *Growing Your Range Poultry Business: An Entrepreneur's Toolbox*. This publication offers a decision-making tree for poultry marketing and processing that can help you further evaluate opportunities.

MARKETING **Rank the following with a score of 1 to 3 where:** **1 = no 2 = somewhat 3 = yes**	**CONTRACT MARKETING** (integrator)	**INTERMEDIARY MARKETING** (retailers, wholesalers)	**DIRECT MARKETING** (farmers' market, subscription, or CSA buyers)
Do you farm near buyers associated with this marketing alternative?			
Do you have the skills to market under this alternative?			
Can someone perform the labor/marketing work that may be required under this alternative?			
Can you satisfy legal obligations associated with this alternative?			
Do you have few competitors for this market?			
Will this alternative require little or no promotion/ advertising?			
Does this alternative promise price premiums?			
Is this alternative compatible with your values?			
Will this alternative help you reach goals?			
Does your family support this alternative?			
TOTAL SCORE			

PROCESSING **Rank the following with a score of 1 to 3 where:** **1 = no 2 = somewhat 3 = yes**	**ON-FARM MANUAL**	**ON-FARM MOBILE**	**OFF-FARM CUSTOM HIRE**
Do you have the resources needed? (Nearby facility or own site, building, water, equipment, skills, finances)			
Can you satisfy the legal obligations (construction, health, licensing) associated with this processing alternative?			
Does this alternative create marketing flexibility (allow you to market off-farm or out-of-state)?			
Is this alternative financially feasible?			
Is this alternative compatible with your values?			
Does this alternative help you reach goals?			
Does your family support this alternative?			
TOTAL SCORE			

MANAGEMENT **Rank the following with a score of 1 to 3 where:** **1 = no 2 = somewhat 3 = yes**	**INDUSTRIAL**	**TRADITIONAL**	**DAY-RANGE**	**DAILY MOVE PENS**	**ORGANIC**
Do you have the resources? (land, building, water, equipment, skills, finances)					
Can you satisfy legal obligations (construction permits, licenses)?					
Does this alternative generate marketing flexibility?					
Does this alternative provide income security?					
Does this alternative complement other enterprises?					
Is this alternative compatible with your values?					
Does this alternative help you attain goals?					
Does your family support this alternative?					
Can you easily exit poultry production under this alternative if you choose to do so?					
Can you salvage equipment and other investments necessary under this alternative should you choose to exit poultry production?					
TOTAL SCORE					

YOUR PLAN

Enterprise plans can help make your idea a success. By mapping out your poultry enterprise ideas, explaining them on paper, and developing a budget, you and your family will be in a better position to make it really work. An enterprise plan will be invaluable if you intend to secure financing for new equipment or if you are interested in developing cooperative marketing and processing relationships. An enterprise plan can help you spot problems on paper before investing time, money, and other resources. Last, but not least, an enterprise plan is a permanent record of your goals, projected output, sales estimates, and financial returns. In other words, an enterprise plan serves as a monitoring tool from which to evaluate the enterprise once up and running. Are you meeting your goals? Are your birds performing as expected? Are sales materializing? If not, why not?

Below are some questions to help you develop a poultry enterprise plan. Answer these questions for the marketing, processing, and management alternatives you've chosen. Use your answers to these questions to begin writing a plan for your poultry enterprise. Be sure to look up CIAS' *Generic Poultry Enterprise Budget* and NCAT's *Growing Your Range Poultry Business: An Entrepreneur's Toolbox* in **Resources**.

Marketing

Who are your customers?
What do they want?
Where do your customers shop: farmers' market, retail outlet, other?
Do you have any competitors?
How will you advertise products and reach customers?
What are your legal handling obligations?
How will you deliver your products?
What will your products sell for ($)?
How much do you expect to sell (sales volume)?
How much income do you expect to earn from poultry product sales (gross)?

Processing On-farm

How many eggs and birds will you process each season?
Will you process manually or mechanically?
Where will you set up your processing facilities?
What type of equipment and supplies will you need?
Where will you get your equipment and supplies?
What will equipment and supplies cost?
How much time will it take to process eggs and birds?
Will you have help?
How much will you spend on labor?
What type of permits and inspections will be required?
How will you store products?

Processing Off-farm

Is there a custom processor located near by?
Will this processor:
- Handle the species you plan to market?
- Use your recipes or labels?
- Handle birds year-round?
- Perform ethnic slaughter?

Processing Off-farm (continued)

Is the processor inspected at the federal or state level?
Is the processor custom exempt?
Is the processor certified organic?
Does the processor require a minimum?
What are the processor's fees?
What type of packaging is offered?

Production

What type of management system is compatible with your market?
Will this management system allow you to operate year-round or seasonally?
How will you control disease and manage mortalities?
Will you enjoy this type of management?
Does this management system complement other enterprises on the farm?
How much land is required?
What type of buildings will be needed?
What type of equipment and supplies will be needed?
Do you have the physical resources to manage your birds this way?
If not, how will you acquire these resources?

Finances

How much money do you want to generate from the poultry enterprise?
What will your total start-up expenses total for buildings, equipment, and supplies?
What will your annual operating expenses total for marketing, processing and production?
What is your expected gross income/sales revenue?
What is your expected net return/profit?
Do you have good financial records?
How much can you afford to invest in the enterprise?
How much price variability are you comfortable with?
Do you need to generate cash from the enterprise year-round?

REFERENCES

Arbor Acres. 2004. Broiler Performance Standards. www.aa-na.aviagen.com.

Behar, Harriet. 2004. Understanding the NOP: Pasture for Ruminants and Outdoor Access for Livestock. *The Organic Broadcaster*. Volume 12, Number 2.

Bell, Donald M. and Willliam D. Weaver, Jr. 2002. *Commercial Chicken Meat and Egg Production*, Fifth Edition, Kluwer Academic Publishers.

Broiler and Egg Association of Minnesota. Egg Industry Facts. www.minnesotaturkeys.com/beam.html

California Poultry Workgroup. 1998, Second Edition. Turkey Care Practices. *Animal Care Series*. Cooperative Extension, University of California, Davis.

Callister, Lori. 2004. Are You Ready to Operate Your Own Processing Plant? Handout at Upper Midwest Organic Farming Conference, LaCrosse, WI.

Center for Integrated Agricultural Systems (CIAS). 2003. Large-Scale Pasture Poultry Farming in the U.S. University of Wisconsin. Research brief #63.

Chisholm, Joy, David Trott, Catherine Zivnuska, Jeff Cox and Micheal Seipel. 2003. Pastured Poultry Research. Truman State University Agricultural Science.

Cooperative Development Services. 2001. Meat Consumption and Purchasing Trends within the Hispanic and Hmong Communities of Minnesota and Wisconsin. Prepared for the Minnesota Food Association.

Cunningham, Dan L. 2002a. Guidelines for Prospective Contract Hatching Egg Producers. Cooperative Extension Service, University of Georgia. Bulletin 1214.

Cunningham, Dan L. 2002b (revised). Guide for Prospective Contract Broiler Producers. Cooperative Extension Service, University of Georgia. Bulletin 1167.

Cunningham, Dan. 1999 (revised). "Contract Broiler Production: Questions and Answers." University of Georgia, Extension. Leaflet 423.

Damron, B. L. and R.R. Sloan. 1998. Small Poultry Flock Nutrition. Institute of Food and Agricultural Sciences. Cooperative Extension Service, University of Florida. Fact Sheet PS-29.

Damerow, Gail. 1994. Chapter One: Chicken Health. *The Chicken Health Handbook*. Storey Publishing.

DiGiacomo, Gigi, Robert King and Dale Nordquist. 2004. *Building a Sustainable Business: A Guide to Developing a Business Plan for Farms and Rural Businesses*. Minnesota Institute for Sustainable Agriculture, St. Paul, MN. www.misa.umn.edu.

Doye, Damona G., Joe G. Berry, Parman R. Green, and Patricia E. Norris. 1996. Broiler Production: Considerations for Potential Growers. Oklahoma Cooperative Extension Service. F-202.

Eco-Friendly Foods, LLC. 2003. Issues With Day Range. Moneta, Virginia. www.ecofriendly.com.

Elfering, Kevin. Poultry Exemptions, Egg Licensing Exemptions. Memo: 2003-02. State of Minnesota, Department of Agriculture, Dairy Food and Meat Inspection. May 8, 2003.

Ekarius, Carol. 2004. *How to Build Animal Housing*. Storey Publishing.

Fanatico, Anne. 1998. Feeding Chickens: Livestock Production Guide. ATTRA.

Fanatico, Anne. 2002a. Sustainable Poultry: Production Overview. ATTRA.

Fanatico, Anne. 2002b. Sustainable Poultry (Range) Production. *Future Farms 2002: A Supermarket of Ideas*. Kerr Center for Sustainable Agriculture.

Fanatico, Anne. 2003a. Small-Scale Poultry Processing. ATTRA.

Fanatico, Anne. 2003b. Egg Processing by Hand. *APPPA GRIT*, American Pastured Poultry Producers Association. Issue No. 26.

Fanatico, Anne and David Redhage. 2002. *Growing Your Range Poultry Business: An Entrepreneur's Toolbox*. ATTRA.

Franczyk, Don. 2002. Research on Pastured Poultry Breeds. Special Supplement on On-Farm Research. *The Natural Farmer*.

Geiger, Glenn and Harold Biellier. 1993a (reviewed). Brooding and Rearing Ducklings and Goslings. Department of Animal Sciences, University of Missouri Extension. G8920.

Geiger, Glenn and Harold Biellier. 1993b (reviewed). Weeding with Geese. Department of Animal Sciences, University of Missouri Extension. G8922.

Greene, Catherine and Amy Kremen. 2003. U.S. Organic Farming in 2000-2001: Adoption of Certified Systems. Economic Research Service, USDA.

REFERENCES

Hamilton, Neil D. 1999. Marketing High Value Products and Processed Foods. *The Legal Guide for Direct Farm Marketing*. Drake University.

Hamilton, Neil D. 2001. A Current Broiler Contract Analysis Addressing Legal Issues and Grower Concerns. *Assessing the Impact of Integrator Practices on Contract Poultry Growers*. Chapter 3. Farmers' Legal Action Group, Inc.

Hamilton, Ron and Sheila Hamilton. 2004. Organic Poultry on Pasture. Presentation at the Midwest Organic and Sustainable Education Service Organic University. February 26, 2004, La Crosse, WI.

Holderread, Dave. 1993 (revised). *The Book of Geese: A Complete Guide to Raising the Home Flock*. Hen House Publications.

Holderread, Dave. 2001. *Storey's Guide to Raising Ducks: Breeds, Care, Health*. Storey Books.

Lee, Andy and Patricia Foreman. 2002. *Day Range Poultry: Every Chicken Owner's Guide to Grazing Gardens and Improving Pastures*. Good Earth Publications, LLC.

Lehnert, Richard H. 2002. On-Farm Processing of Pastured Poultry: Clearing a Path for Legal Sale of Poultry Processed by Michigan Farmers. Michigan Integrated Food & Farming Systems.

Kennard, D.C. 1951. Forage for Poultry. *Forages*. Chapter 60. Ohio Agricultural Experiment Station.

Manitoba Agriculture and Food. 2002. Pastured Poultry. www.gov.mb.ca/agriculture/livestock/poultry/bba00s00.html.

Mattocks, Jeff. 2002. Pasture-Raised Poultry Nutrition. Prepared for Heifer International by the Fertrell Company.

Mercia, Leonard S. 2001. *Storey's Guide to Raising Poultry: Breeds, Care, Health*. Storey Books.

Metzer Farms. 2004. Duck and Goose Hatchery: How to Process Our Birds. www.metzerfarms.com/process.htm.

Minnesota Department of Agriculture. N.D. Sale of Shell Eggs to Grocery Stores and Restaurants. Meat Poultry and Egg Inspection Program. www.mda.state.mn.us/dairyfood/factsheets/eggsafety.htm.

Minnesota Department of Agriculture. N.D. Fact Sheet for Sale of Meat and Poultry Products to Grocery Stores and Restaurants. Meat Poultry and Egg Inspection Program.

Minnesota Turkey Research & Promotion Council and the Minnesota Turkey Growers Association. 2004. Minnesota Turkey Industry — An Overview. www.eatmoreturkey.com.

Muntz, Steven. 1999. Opportunities in the Evolving Range/Pastured Poultry Industry. Proceedings of the Second National Small Farm Conference, St. Louis, MO.

National Center for Appropriate Technology (NCAT). 2004 (revised). NCAT's Organic Livestock Workbook — A Guide to Sustainable and Allowed Practices. ATTRA. www.attra.ncat.org/attra-pub/PDF/livestockworkbook.pdf.

National Chicken Council. 2002. US Broiler Performance. www.nationalchickencouncil.com/statistics/

Neufeld, Liz. 2002 (reviewed). Consumer Preferences for Organic/Free-Range Chicken. Agricultural Marketing Resource Center, Department of Agricultural Economics, Kansas State University.

Noll, Sally. 1998. Game Birds. *Alternative Animal Enterprises*. University of Minnesota Extension. FS-03604.

Ollinger, Michael, James MacDonald, and Milton Madison. 2000. "Poultry Plants Lowering Production Costs and Increasing Variety." *Food Review*. Economic Research Service, USDA. Volume 23, Issue 2.

Plamondon, Robert. 2003. *Range Poultry Housing*. ATTRA.

Plamondon, Robert. Egg Quality/Egg Washing. Poultry FAQ: Frequently Asked Questions About Poultry. www.plamondon.com/poultryfaq.shtml.

Polson, Skip and Anne Fanatico. 2002. Which Bird Shall I Raise? Genetic Options for Pastured Poultry Producers: Meat-Type Chickens and Turkeys. American Pastured Poultry Producers Association (APPPA).

Robinson, Jo. 2004. *Pasture Perfect: The Far-Reaching Benefits of Choosing Meat, Eggs, and Dairy Products from Grass-Fed Animals*. Vashon Island Press.

Salatin, Joel. 1999a (second reprinting). Exotics. *Pastured Poultry Profits*. Polyface, Inc. Swoope, VA.

Salatin, Joel. 1999b (second reprinting). Turkeys. *Pastured Poultry Profits*. Polyface, Inc. Swoope, VA

Schrader, Lee and John Wilson. 2001. Broiler Grower Survey Report. *Assessing the Impact of Integrator Practices on Contract Poultry Growers*. Chapter Two. Farmers Legal Action Group. St. Paul, MN.

REFERENCES

Shelquist, Kim. 2002. Pasture Raised Products Message and Strategy: Consumer Focus Group Study. Food Routes Network/ Midwest Collaborators. www.misa.umn.edu.

Sustainable Agriculture Network, USDA. 2002. Profitable Poultry: Raising Birds on Pasture. www.sare.org/publications/index.htm

Taylor, Robert C. 2002. Restoring Economic Health to Contract Poultry Production. *Agricultural & Resource Policy Forum*. College of Agriculture, Auburn University.

Tecstra Systems Corp. Egg Nutritional Facts. 1999-2004. www.hormel.com.

University of Wisconsin Extension Emerging Markets Team and Wisconsin Department of Agriculture, Trade and Consumer Protection. 2003. *Direct Marketing Meat: A Resource for Direct Market Meat Producers in Wisconsin*.

USDA, Agricultural Marketing Service. Poultry Grading and Certification. www.ams.usda.gov/poultry/grading/pygrd.htm.

USDA, Agricultural Marketing Service. 2002. United States Classes, Standards, and Grades for Poultry. 70.200 *et seq*.

USDA, Agricultural Marketing Services. 2003. Organic Feed for Poultry & Livestock: Availability and Prices.

USDA, Economic Research Service. 1997 and 2001. Certified Organic Livestock, By State.

USDA, Economic Research Service. 2004. USDA Agricultural Baseline Projections to 2013. Interagency Agricultural Projections Committee. WAOB-2004-1.

USDA, Economic Research Service. 2004. Per Capita Egg Consumption by Quarter.

USDA, Food Safety and Inspection Service (PSIS). 2000 (revised). Meat Packaging Materials. www.fsis.usda.gov/oa/pubs/meatpack.htm.

USDA, Food Safety Inspection Service. 2003. FSIS Proposes to Revise Classes of Poultry, Provide Consumers With More Accurate Labeling. News Release. September 30, 2003.

USDA, National Agricultural Statistics Service (NASS). 2004. Poultry — Production and Value, 2003 Summary.

Wisconsin Department of Agriculture, Trade and Consumer Protection (WDATCP). 1996. Egg Grading, Handling and Labeling. Wisconsin Administrative Code. Chapter ATCP 88, *Register* No. 490.

Wisconsin Department of Agriculture Trade and Consumer Protection. 2002. Meat and Meat Products. Wisconsin Administrative Code. Chapter ATCP 55, *Register* No. 55.

AGENCIES AND ORGANIZATIONS

Agricultural Technology Transfer for Rural Areas (ATTRA), PO Box 3657, Fayetteville, AR 72702. (800) 346-9140. www.attra.ncat.org

American Pastured Poultry Producers Association (APPPA), PO Box 1024, Chippewa Falls, WI 54729. (715) 667-5501. grit@apppa.org www.apppa.org

American Poultry Association (APA), PO Box 2209, Mango, FL 33550-2209. (508) 473-8769. www.amerpoultryassn.com

Animal and Plant Health Inspection Service (APHIS), USDA. www.aphis.usda.gov

Broiler and Egg Association of Minnesota, 108 Marty Dr., Buffalo, MN 55313. (763) 682-2171. www.minnesotaturkey.com Click on "BEAM" under "About Us"

Center for Integrated Agricultural Systems (CIAS), University of Wisconsin, College of Agricultural and Life Sciences, 1450 Linden Drive, Madison, WI 53706. (608) 262-8018. www.cias.wisc.edu

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Department of Animal Science, University of Minnesota, 205 Haecker Hall, 1364 Eckles Ave., St. Paul, MN 55108-6118. (612) 624-3237. www.ansci.umn.edu

Department of Animal Sciences, University of Wisconsin, Room 256, 1675 Observatory Dr., Madison, WI 53706. (608) 263-4300. www.ansci.wisc.edu

Farmers Legal Action Group, Inc. 360 N. Robert St., Ste. 500, St. Paul, MN 55101-1109. (651) 223-5400. www.flaginc.org

Food and Drug Administration (FDA), 5600 Fishers Ln., Rockville, MD 20857-0001. (888) 463-6332. www.fda.gov

Michigan Allied Poultry Industries Inc., 5635 Forest Glen Drive SE, PO Box 242, Ada, MI 49301-9111. (616) 676-5593. gehouse@comcast.net

Michigan Department of Agriculture, PO Box 30017, Lansing, MI 48909. (800) 292-3939. www.michigan.gov/mda

Michigan Food and Farming Systems (MIFFS). 115 Manley Miles Bldg, 1405 S. Harrison Rd., East Lansing, MI 48823-5243. (517) 432-0712. www.miffs.org

Michigan Turkey Producers, 2140 Chicago Dr., Wyoming, MI 49509. (616) 245-2221. michiganturkey@novgate.com

Midwest Organic and Sustainable Education Service (MOSES), PO Box 339, Spring Valley, WI 54767. (715) 772-3153. www.mosesorganic.org

Midwest Organic Services Association (MOSA), PO Box 344, Viroqua, WI 54665. (608) 637-2526. mosa@mosaorganic.org

Midwest Poultry Federation, 108 Marty Drive Buffalo, MN 55313. (763) 682-2171. theresa@midwestpoultry.com Hosts annual, regional poultry convention.

Minnesota Department of Agriculture (MDA), 625 N. Robert St., St. Paul, MN 55155. (651) 201-6000. www.mda.state.mn.us

- Ag Marketing Services Division (MDA). (651) 201-6008. www.mda.state.mn.us/about/divisions/agmktg.htm
- Meat, Poultry and Egg Inspection Program (MDA). (651) 201-6027. www.mda.state.mn.us/licensing/meategg/default.htm

Minnesota Turkey Research & Promotion Council/ Minnesota Turkey Growers Association, 108 Marty Drive, Buffalo, MN 55313. (763) 682-2171. info@minnesotaturkeys.com

AGENCIES AND ORGANIZATIONS (continued)

National Contract Poultry Growers Association. 1592 Haw Branch Rd., Sanford, NC 27330. (888) 787-9813. www.ncpga.info/

Organic Materials Review Institute (OMRI). Box 11558, Eugene, OR 97440. (541) 343-7600. info@omri.org www.omri.org

Sand Hill Preservation Center, 1878 230th St., Calamus, IA. 52729. (563) 246-2299. sandhill@fbcom.net www.sandhillpreservation.com

USDA, Agricultural Marketing Service (AMS), Poultry Programs, 1400 Independence Ave., Washington, DC 20250. (202) 720-4476. www.ams.usda.gov

USDA, Food Safety and Inspection Service (FSIS), Washington, DC 20250-3700. (888) 674-6854. www.fsis.usda.gov

USDA, Grading Branch, Agricultural Marketing Service, STOP 0258, Room 3938 South, 1400 Independence Ave. SW., Washington, DC 20250. (202) 720-3271. www.ams.usda.gov/poultry/grading/pygrd.htm

USDA, National Organic Program (NOP). Room 4008-South Building, 1400 Independence Ave. S.W., Washington, DC 20250-0020. (202) 720-3252. www.ams.usda.gov/nop

USDA, Sustainable Agriculture Research and Education (SARE). North Central Region Office. University of Nebraska-Lincoln, 13-A Activities Bldg. Lincoln, NE 68583-0840 Bill Wilcke, Coordinator (402) 472-7081. www.sare.org

Wisconsin Association of Meat Processors, PO Box 505, Bloomington, WI 53804. (608) 994-3173. www.wi-amp.com

Wisconsin Department of Agriculture, Trade and Consumer Protection, 2811 Agriculture Dr., Madison, WI 53718. (608) 224-5100. www.datcp.state.wi.us

PUBLICATIONS

Budgeting, Enterprise Planning and Recordkeeping

Building a Sustainable Business. DiGiacomo, Gigi, Robert King, and Dale Nordquist. MISA. 2003. Available from MISA or SARE (see *Agencies and Organizations*).

Consumer Preferences for Organic/Free-Range Chicken. Liz Neufeld. Agricultural Marketing Resource Center, Department of Agricultural Economics, Kansas State University. 2002 (reviewed). Available from Department of Agricultural Economics, 342 Waters Hall, Kansas State University, Manhattan, KS 66506-4011. (785) 532-6702. www.agecon.ksu.edu

Direct Marketing Profits … Direct Marketing Poultry Enterprise. 2002. Dennis Day, Rod Carlyon, and Dean Dyck. Agriculture, Food & Rural Development. Available from Alberta Government, J.G. O'Donoghue Building, 7000 113th St., Edmonton, AB T6H 5T6, Canada. (800) 292-5687. www.agric.gov.ab.ca

Generic Poultry Enterprise Budget. Version 1.32. CIAS. N.D. Available from CIAS (see *Agencies and Organizations*).

Growing Your Range Poultry Business: An Entrepreneur's Toolbox. Anne Fanatico. National Center for Appropriate Technology (NCAT). 2002. Available from ATTRA (see *Agencies and Organizations*).

Recordkeeping. Dan Bennett. *Grit*. American Pastured Poultry Producers Association (APPPA). Issue 28. 2003. Available from APPPA (see *Agencies* and *Organizations*).

PUBLICATIONS (continued)

Day-range/Free Range

Day Range Poultry: Every Chicken Owner's Guide to Grazing Gardens and Improving Pastures. Andy Lee and Patricia Foreman. Good Earth Publications, LLC. 2002. Available from your local library or Good Earth Publications, 20 GreenWay Place, Buena Vista, VA 24416. (800) 499-3201. www.goodearthpublications.com

Free-Range Poultry. Katie Thear. Farming Press. 1997, Second Edition. Available from your local library or from Back Forty Books, Nature's Place Sanctuary, Hartshorn, MO 65479. (866) 596-9982. www.back40books.com

Range Poultry Housing. Robert Plamondon. ATTRA. 2003. Available from ATTRA (see *Agencies and Organizations*).

Feed and Diet

Feeding Chickens. Anne Fanatico. ATTRA. 1998. Available from ATTRA (see *Agencies and Organizations*).

Feeding Game Birds. Tom W. Smith. Mississippi State University Extension Service. Available from Mississippi State University, Department of Poultry Science, www.msstate.edu/dept/poultry/bwgfeed.htm

Feeding Poultry: The Classic Guide to Poultry Nutrition. G.F. Heuser. Norton Creek Press. 2003 (reprint) Available from your local library or Norton Creek Press 36475 Norton Creek Rd., Blodgett, OR 97326. (541) 453-5841. www.nortoncreekpress@plamondon.com

Increasing Omega-3 Fatty Acids in Eggs from Small Chicken Flocks. Manitoba Department of Agriculture and Food. 2001. Available from Manitoba Agriculture, Food & Rural Initiatives, 545 University Crescent, Winnipeg, MB R3T 5S6. (204) 945-0381. www.gov.mb.ca/agriculture/livestock/poultry

Nutrient Requirements of Chickens and Turkeys. Jeffrey D. Firman. Department of Animal Sciences, University of Missouri-Columbia. G8352. 1993 (reviewed). Available from Department of Animal Sciences, University of Missouri, S108 Animal Sciences Center, 920 East Campus Drive, Columbia, MO. 65211-5300. (573) 882-1381. www.extension.missouri.edu/explore/agguides/poultry/g08352.htm

Nutrient Requirements of Poultry. National Academy Press. 1984, 8th Revised Edition. Available from National Academy Press, 500 Fifth St. NW., Lockbox 285, Washington, DC 20055. (888) 624-8373. www.nap.edu

Organic Feed Sources. University of Minnesota, Department of Animal Science. N.D. Available from Department of Animal Science, University of Minnesota (see *Agencies and Organizations*). www.ansci.umn.edu/poultry/resources/organic_feed_sources.htm

Organic Livestock Feed Suppliers. Anne Fanatico and Raeven Thomas. ATTRA. 2002. Available from ATTRA (see *Agencies and Organizations*).

Pasture-Raised Poultry Nutrition. Jeff Mattocks. Fertell Company, Bainbridge, PA. 2002. Available from APPPA (see *Agencies and Organizations*).

Food Safety

Basics for Handling Food Safely. In Food Safety Facts. Food Safety and Inspection Service, USDA. 2003. Available from USDA, FSIS (see *Agencies and Organizations*).

Good Management Practices for Salmonella Risk Reduction in the Production of Table Eggs. David A. Halvorson. University of Minnesota Extension Service. BU-06054. 1992. Available from University of Minnesota Extension Service, 1420 Eckles Ave., St. Paul, MN 55108-6068. (612) 624-1222. www.extension.umn.edu

PUBLICATIONS (continued)

Safe Handling of Raw Meat and Poultry. Diane Corrin. University of Minnesota Extension Service. Number 767. 1997. Available from University of Minnesota Extension Service, 1420 Eckles Ave., St. Paul, MN 55108-6068. (800) 976-8636. www.extension.umn.edu

Grading

USDA Egg-Grading Manual. AMS, USDA. Agricultural Handbook Number 75. 2000. Available from AMS Poultry Programs (see *Agencies and Organizations*).

USDA Poultry-Grading Manual. AMS, USDA. Agricultural Handbook No. 31. 1998 (revised). Available from AMS, Poultry Programs (see *Agencies* and *Organizations*).

Housing

Barns, Sheds & Outbuildings: Placement, Design and Construction. Byron D. Halsted, Ed. Alan C. Hood & Co. 1994. Available from Alan C. Hood & Co., PO Box 775, Chambersburg, PA 17201. (717) 267-0867.

Broiler Housing. Wayne Winchell and Norm Bird. Canada Plan Service. M-5310. N.D. Available from Ontario Ministry of Agriculture, Food and Rural Affairs, www.cps.gov.on.ca/english/plans/E5000/5310/M-5310L.pdf

Chapter Two: Poultry Housing and Equipment. ***Storey's Guide to Raising Poultry: Breeds, Care, Health.*** Leonard S. Mercia. Storey Books. 2001. Includes poultry house plans. Available from your local library or Storey Books, 210 MASS MoCA Way, North Adams, MA 01247. (800) 441-5700. www.storey.com

Electric Fence Design. ***Livestock and Range Report No. 922.*** David W. Pratt. Napa and Solano Counties UCCE, Livestock /Range Management Program. 1992. Available from University of CA Cooperative Extension, 501 Texas St., Fairfield, CA 94533. (707) 435-2459. www.goatconnection.com/articles/publish/article_95.shtml

How to Build Animal Housing. Carol Ekarius. Storey Publishing. 2004. Available from your local library or Storey Books, 210 MASS MoCA Way, North Adams, MA 01247. (800) 441-5700. www.storey.com

Poultry Housing and Design [Links]. University of Minnesota, Department of Animal Science. N.D. Available from Department of Animal Science, (see *Agencies and Organizations*). www.ansci.umn.edu/poultry/resources/housing.htm

Range Poultry Housing. Robert Plamondon. ATTRA. 2003. Available from ATTRA (see *Agencies and Organizations*).

Watering System Comparisons. Jody Padgham. *Grit*. APPPA. Issue 24. DATE. Available from APPPA (see *Agencies and Organizations*).

Poultry Plan [Links]. Extension Agriculture & Biosystems Engineering. North Dakota State University. Variety of reproduced new and historic plans. Individual plans available from North Dakota State University, PO Box 5626, Fargo, ND 58105. (701) 231-7236. www.ag.ndsu.nodak.edu/abeng/plans/POULTRY.htm.

Labeling

Food Labeling Guide. FDA. 1999 (revised). Available from FDA, Center for Food Safety and Applied Nutrition, 200 C St. SW, Washington, DC 20204. (202) 485-0282. www.cfsan.fda.gov/~dms/flg-toc.html

Legal Considerations

Broiler Production: Considerations for Potential Growers. Damona G. Doye, Brian Freking, and Joshua Payne. N.D. Oklahoma Cooperative Extension Service. F-202. Available from University Mailing Services, OSU, 109 University Printing Building, Stillwater, OK 74078-7001. (405) 744-9037. www.poultrywaste.okstate.edu/files/f-202web.pdf

PUBLICATIONS (continued)

Chickens Galore, LLC or How to Protect Your Business Through Legal Structuring. Jody Padgham. *Grit*. APPPA. Issue 26. 2003. Available from APPPA (see *Agencies and Organizations*).

Legal Guide to Direct Farm Marketing. Neil Hamilton. Drake University. 1999. Available from the Agriculture Law Center, Law School, Drake University, 2507 University Ave., Des Moines, IA 50311. (515) 271-2947. www.iowafoodpolicy.org/legalguide.htm

National Organic Program: Compliance Checklist for Producers. ATTRA. 2003. Available from ATTRA (see *Agencies and Organizations*).

On-Farm Processing of Pastured Poultry: Clearing a Path for Legal Sale of Poultry Processed by Michigan Farmers. 2002. Richard H. Lehnert and John Durling. Michigan Integrated Food & Farming Systems (MIFFS) (see *Agencies and Organizations*). www.miffs.org/pasturepoultry.pdf

Marketing

Adding Value to Farm Products: An Overview. Janet Bachmann. ATTRA. 1999. Available from ATTRA (see *Agencies and Organizations*).

Collaborative Marketing: A Roadmap and Resource Guide for Farmers. Robert P. King and Gigi DiGiacomo. University of Minnesota Extension. BU-7539-S. 2000. Available from MISA (see *Agencies and Organizations*).

Direct Marketing Meat: A Resource for Direct Market Meat Producers in Wisconsin. Greg Lawless (Ed). University of Wisconsin Extension, Emerging Ag Markets (EAM) Team and the Wisconsin Department of Agriculture, Trade & Consumer Protection. 2003. Available from Wisconsin Farm Center, Wisconsin Department of Agriculture, Trade & Consumer Protection, (see *Agencies and Organizations*). www.datcp.state.wi.us

Direct Marketing Today: Challenges and Opportunities. AMS, USDA. 2000. Available from AMS, Poultry Programs (see *Agencies and Organizations*).

Free-Range Poultry Production & Marketing: A Guide to Raising, Processing, and Marketing Premium Quality Chicken, Turkey & Eggs. Herman Beck-Chenoweth. Back Forty Books, 1997. Available from Back Forty Books, Nature's Place Sanctuary, Hartshorn, MO 65479. (866) 596-9982. www.back40books.com

Fact Sheet for Sale of Meat and Poultry Products to Grocery Stores and Restaurants. Meat Poultry and Egg Inspection Program, Minnesota Department of Agriculture. Available from MDA (see *Agencies and Organizations*).

Fact Sheet for Sale of Shell Eggs to Grocery Stores and Restaurants. Meat Poultry and Egg Inspection Program, Minnesota Department of Agriculture. Available from MDA (see *Agencies and Organizations*).

Marketing Strategies for Farmers and Ranchers. Sustainable Agriculture Network, USDA. 2003 (updated). Available from SARE (see *Agencies and Organizations*).

Pasture Raised Products Message and Strategy: Consumer Focus Group Study. Kim Shelquist. Food Routes Network/Midwest Collaborators. 2002. Available from the Leopold Center, 209 Curtiss Hall, Iowa State University, Ames, IA 50011-1050. (515) 294-3711. www.leopold.iastate.edu/research/grants/finalreports.htm

Organic

NCAT's Organic Livestock Workbook – A Guide to Sustainable and Allowed Practices. National Center for Appropriate Technology (NCAT). 2004 (revised). Available from ATTRA (see *Agencies and Organizations*) or in full text online www.attra.ncat.org/attra-pub/PDF/livestockworkbook.pdf

PUBLICATIONS (continued)

The Fourth National Organic Farmers' Survey: Sustaining Organic Farms in a Changing Organic Marketplace. Organic Farmers Research Foundation (OFRF). 2004. Available from OFRF, PO Box 440, Santa Cruz, CA 95061. (831) 426-6606. www.ofrf.org

The Organic Broadcaster. Midwest Organic and Sustainable Education Services (MOSES). Quarterly newsletter. Available from MOSES (see *Agencies and Organizations*).

Organic Farm Certification and the National Organic Program. George Kuepper. ATTRA. 2002. Available from ATTRA (see *Agencies and Organizations*).

Organic Feed for Poultry & Livestock: Availability and Prices. AMS, USDA. 2003. Available from AMS (see *Agencies and Organizations*).

The Organic Price Index. New Farm. Updated regularly. Available on the Internet at www.newfarm.org/opx

Organic Compliance Checklist for Producers. ATTRA. 2003. Available from ATTRA (see *Agencies and Organizations*).

Transitioning to Organic Production. Diana Friedman. Sustainable Agriculture Network, USDA. Bulletin 408. Available from SARE (see *Agencies and Organizations*).

The Upper Midwest Organic Resource Directory. Midwest Organic and Sustainable Education Services. Updated annually. Available from MOSES (see *Agencies and Organizations*).

USDA-Accredited Organic Certifiers Active in Minnesota. Minnesota Department of Agriculture. Available from MDA (see *Agencies and Organizations*).

Packaging

EggCartons.com, Kings Supply, 24 Holt Rd., PO Box 302, Manchaug, MA 01526-0302. (888) 852-5340. www.eggcartons.com

Meat Packing Materials. FSIS, USDA. 2000 (revised). Available from FSIS (see *Agencies and Organizations*).

Cutler's Supply. 1940 N Old 51, Applegate, MI 48401. (810) 633-9450. sales@cutlersupply.com

Pasture Management

Sources of Organic Fertilizers and Amendments. Julia Sampson, George Kuepper and Steve Diver. ATTRA. 2002. Available from ATTRA (see *Agencies and Organizations*).

Forage Legumes: Second Edition – Clovers, Birdsfoot Trefoil, Cicer Milkvetch, Crownvetch, and Alfalfa. Craig C. Sheaffer, Nancy J. Ehlke, Kenneth A. Albrecht, and Paul R. Peterson. 2003. Minnesota Agricultural Experiment Station Bulletin SM-05963. Available from University of Minnesota Extension Distribution Center, 405 Coffey Hall, 1420 Eckles Ave., St. Paul, MN 55108-6068. (800) 876-8636. www.extension.umn.edu/distribution/cropsystems/DC5963.html

Identifying Pasture Grasses. Dan Undersander, Michael Casler, Dennis Cosgrove, and Neal Martin. University of Wisconsin-Extension publication A3637. 1996. Available from University of Wisconsin-Extension, PO Box 342831, Milwaukee, WI 53234-2831. (877) 947-7827.

Pastured Poultry

Eggs on Pasture? Jody Padgham. APPPA. *Grit* Issue 26. 2003. Available from APPPA (see *Agencies and Organizations*).

Profitable Poultry: Raising Birds on Pasture. Sustainable Agriculture Network, USDA. January 2002. Available from SARE (see *Agencies and Organizations*).

PUBLICATIONS (continued)

Raising Poultry on Pasture. CIAS. Research Brief #57. 2001. Available from CIAS (see *Agencies and Organizations*) or in full text on the Internet at www.cias.wisc.edu/pdf/rb57a.pdf

Pastured Poultry Profits: Net $25,000 in 6 Months on 20 Acres. Joel Salatin. Polyface, Inc. 1993. Available from your local library or from Polyface, Inc., 43 Pure Meadows Ln., Swoope, VA 24479. (540) 885-3590.

Poultry Health and Welfare

Chicken Health Handbook. Gail Damerow. Storey Publishing. 1994. Available at your local library or from Storey Books, 210 MASS MoCA Way, North Adams, MA 01247. (800) 441-5700. www.storey.com

Diseases of Free-Range Poultry. Victoria Roberts. Whittet Books, UK. 2000. Available from Whittet Books, Hill Farm, Stonham Rd., Cotton, Stowmarket, Suffolk, IP14-4RQ, United Kingdom. 44(0)1449-781-877. www.whittetbooks.com or www.amazon.co.uk

Mortality: Common Causes. Jeff Mattocks. *Grit*. APPPA. 2002. Available from APPPA (see *Agencies and Organizations*).

Poultry and Waterfowl Problems. Michael Roberts. Gold Cockerel Books, Devon, England. 1998. Available from Gold Cockerel Books, Higher Woodbeer, Kennerleigh, Crediton, Devon, EX17-4RS, United Kingdom. 44(0)1363-866-750. www.poultry-books.co.uk/problems.html www.amazon.co.uk

Remedies for Health Problems of the Organic Laying Flock. Karma E. Glos. Kingbird Farm. Available from Kingbird Farm, 9398 West Creek Rd., Berkshire, NY 13736. (607) 657-2860. Karma@kingbirdfarm.com

Poultry Husbandry

Animal Care Series: Egg-Type Layer Flock Care Practices. Donald Bell, Duncan McMartin, Francine Bradley, and Ralph Ernst. California Poultry Workgroup. University of California, Cooperative Extension. 1998, Second Edition. Available from Veterinary Medicine Extension, School of Veterinary Medicine, #1 Shields Ave., Davis, CA 95616. (530) 752-0853. www.vetmed.ucdavis.edu/vetext/INF-AN.HTML

Animal Care Series: Turkey Care Practices. California Poultry Workgroup. University of California, Cooperative Extension. John C. Voris, Duncan McMartin, and Francine Bradley. 1998, Second Edition. Available from Veterinary Medicine Extension, School of Veterinary Medicine, #1 Shields Ave., Davis, CA 95616. (530) 752-0853. www.vetmed.ucdavis.edu/vetext/INF-AN.HTML

The Book of Geese. Dave Holderread. The Hen House, Corvallis, OR. 1993. Available from your local library, bookstore or www.amazon.com

Raising Game Birds. Dan W. Scheid. Lessiter Publications, Inc., Wisconsin. 1986, Seventh Edition. Available from your local library or from Lessiter Publications, Inc., 225 Regency Ct., Suite 200, Brookfield, WI 53045. (800) 645-8455. www.lesspub.com

Storey's Guide to Raising Chickens: Care, Feeding, and Facilities. Gail Damerow. Storey Books. 1995. Available from your local library or from Storey Books, 210 MASS MoCA Way, North Adams, MA 01247. (800) 441-5700. www.storey.com

Storey's Guide to Raising Poultry: Breeds, Care, Health. Leonard S. Mercia. Storey Books. 2001. Available from your local library or from Storey Books, 210 MASS MoCA Way, North Adams, MA 01247. (800) 441-5700. www.storey.com

PUBLICATIONS (continued)

Storey's Guide to Raising Ducks: Breeds, Care, Health. Dave Holderread. Storey Books. 2001. Available from your local library or from Storey Books, 210 MASS MoCA Way, North Adams, MA 01247. (800) 441-5700. www.storey.com

Storey's Guide to Raising Turkeys: Breeds, Care, Health. Leonard Mercia. Storey Communications, Inc. 2001. Available from your local library or from Storey Books, 210 MASS MoCA Way, North Adams, MA 01247. (800) 441-5700. www.storey.com

Sustainable Poultry: Production Overview. Anne Fanatico. ATTRA. 2002. Available from ATTRA (see *Agencies and Organizations*).

Turkeys: A Guide to Management. David C. Bland. Light Sussex Productions, Sussex, England. 2000. Available from Stromberg's Chicks, PO Box 400, Pine River, MN 56474. (800) 720-1134. www.strombergschickens.com

Poultry Products

Pasture Perfect: The Far-Reaching Benefits of Choosing Meat, Eggs and Dairy Products from Grass-Fed Animals. Jo Robinson. Vashon Island Press. 2004. Available from your local library or from the Store for Healthy Living, PO Box 7321, Tacoma, WA 98406. (866) 453-8489. www.eatwild.com

Processing

Commercial Egg Production and Processing. Ryan A. Meunier and Mickey A. Latour. Purdue University. AS-545-W. N.D. Available from Department of Animal Science, Purdue University, Lilly Hall, 915 W. State St., West Lafayette, IN 47907-2054. (765) 494-4808. http://ag.ansc.purdue.edu/poultry/publication/commegg/

Egg Processing by Hand. Anne Fanatico. *Grit*. APPPA. Issue 26. 2003. Available from APPPA (see *Agencies and Organizations*).

Home Processing of Poultry. Melvin L Hamre. University of Minnesota Extension Service. FO-00701. 1998 (reviewed). Available from University of Minnesota Extension Distribution Center, 405 Coffey Hall, 1420 Eckles Ave., St. Paul, MN 55108-6068. (800) 876-8636. www.extension.umn.edu/distribution/livestocksystems/DI0701.html

Legal Issues for Small-Scale Poultry Processors: Federal and State Inspection Requirements For On-Farm Poultry Production and Processing. Janie Hipp, J.D., LL.M. University of Arkansas. 2001. Available from ATTRA (see *Agencies and Organizations*).

On-Farm Processing of Pastured Poultry: Clearing a Path for Legal Sale of Poultry Processed by Michigan Farmers. Richard H. Lehnert and John Durling. Michigan Integrated Food & Farming Systems (MIFFS). 2002. Available from MIFFS (see *Agencies and Organizations*). www.miffs.org/poultry/handbook.html

Organic Meat & Poultry Processing Basics. Michelle Menken. Minnesota Department of Agriculture. N.D. Available from the MDA (see *Agencies and Organizations*) or on the Internet at www.mda.state.mn.us/esap/organic

Processing Farm-Raised Poultry. R. Scott Beyer and Eric W. Johnson. Kansas State University, Cooperative Extension Service. EP-71. 2000. Available in electronic form only from www.oznet.ksu.edu/library/lvstk2/ep71.pdf

Small-Scale Poultry Processing. Anne Fanatico. ATTRA. May 2003. Available from ATTRA (see *Agencies and Organizations*).

Processors

Directory of Custom Poultry Processors in Minnesota. Jacquie Jacob. Department of Animal Science, University of Minnesota. 2003. Available from Department of Animal Science, University of Minnesota (see *Agencies and Organizations*).

PUBLICATIONS (continued)

Internships and Apprenticeships. ATTRA. Updated often. Lists processors, including poultry processors, seeking assistance. Available from ATTRA (see *Agencies and Organizations*).

Wisconsin Poultry & Egg Directory. Department of Agriculture, Trade and Consumer Protection, Wisconsin Department of Agriculture. Lists poultry processors and suppliers. Available from Wisconsin Department of Agriculture, Trade & Consumer Protection (see *Agencies and Organizations*).

Species/Class/Breed Information

American Livestock Breeds Conservancy (chickens), PO Box 477, Pittsboro, NC 27312. (919) 542-5704. www.albc-usa.org

American Standard of Perfection. Includes description of all species by class, breed, and variety. Available from APA (see *Agencies and Organizations*).

Book of Geese: A Complete Guide to Raising the Home Flock. Dave Holderread. Hen House Publications. 1993 (revised). Hen House Publications Co., PO Box 492, Corvallis, OR 97339. Available from your local library, or bookstore.

Egg Productivity by Breed. Sand Hill Preservation Center. 2001. Available from the Sandhill Preservation Center, 1878 230th St., Calamus, IA 52729-9659. (563) 246-2299. www.sandhillpreservation.com

Poultry Genetics for Pastured Production. Skip Polson and Anne Fanatico. 2005 (revised, Holly Born). Available from ATTRA (see *Agencies and Organizations*).

Storey's Guide to Raising Ducks: Breeds, Care, Health. Dave Holderread. Storey Books. 2001. Available from your local library or from Storey Books, 210 MASS MoCA Way, North Adams, MA 01247. (800) 441-5700. www.storey.com

Storey's Guide to Raising Poultry. Leonard Mercia. Storey Books. 2001. Available from your local library or from Storey Books, 210 MASS MoCA Way, North Adams, MA 01247. (800) 441-5700. www.storey.com

Waste Management

Composting Poultry Carcasses. Dick Adams, Cal Flegal, and Sally Noll. Purdue Cooperative Extension Service. NCR-530. Available from Purdue University Cooperative Extension Service, Media Distribution Center, 301 S. Second St., Lafayette, IN 47907. (317) 494-6794. www.ces.purdue.edu/extmedia/NCR/NCR-530.html

Poultry Waste Management. Sim Reeves, Fred Thornberry, and John B. Carey. Texas A&M University – Cooperative Extension Service. N.D. Available from Cooperative Extension Service, PO Box 1209, Bryan, TX 77806. (888) 900-2577. gallus.tamu.edu/Extension%20publications/Waste/Wastemanagement.htm

HATCHERIES

Bokhari Squab Farms (squab), 2817 Malaga Way, Modesto, CA 95355. (209) 571-0550. www.bokhari.com

Coon Creek Family Farm, Vince & Julie Maro (offers day-old chicks from organically raised breeding stock). W4855 Hemlock Road, Mondovi, WI 54755. (715) 834-4547. www.cooncreekfamilyfarm.com

Murray McMurray Hatchery, PO Box 458, 191 Closz Dr., Webster City, IA 50595. (515) 832-3280 or (800) 456-3280. www.mcmurrayhatchery.com

Rainbow Breeding Company (offers free range broiler parents). PO Box 911, Gentry, AZ 72734. Richard Udale,(479) 685-6349 or richard@yahoo.com and Danny Eiland, (205) 389-3466 or dceiland@hiwaay.net

Squab Producers of California (squab), 409 Primo Way, Modesto, CA 95358. (209) 537-4744. www.squab.com

Tim Shell (offers "pastured peepers" and "CornDel cross" broilers). 407 Mt. Solon Rd., Mt. Solon, VA 22843-9718. (540) 885-4965. tshell@firstva.com

USDA, APHIS-VS (National Poultry Improvement Plan approved hatcheries). Available from Animal and Plant Health Inspection Service (see *Agencies and Organizations*).

Walters Hatchery (heirloom turkeys), Route 3, Box 1490, Stilwell, OK 74960. (918) 778-3535. turkeylink@intellex.com. www.historicalturkeys.com

Yankee Chicks, Inc/Hall Brothers Hatchery (chickens), Jerry Srednicki, PO Box 1026, Norwich, CT 06360. (860) 886-2421 or (860) 608-1389.

SUPPLIERS

Inclusion of a trade name does not imply endorsement of that product by the Minnesota Department of Agriculture, nor does exclusion imply nonapproval.

Ashley Equipment, PO Box 2, Greensburg, IN 47420. (812) 663-2180, Fax: (239) 389-8029

Betco, Inc. PO Box 336, 277 N. Collier Rd., Marco Island, FL 34146. (239) 389-8025. www.betcopoultry-swine.com. Designs and manufactures poultry production buildings.

Brower Equipment, PO Box 2000, Houghton, IA 52361. (319) 469-4141. Supplies "safe food handling" labels.

Buckwheat Growers Association of Minnesota, 206 Aldrich Ave. S., Wadena, MN 56482. (218) 631-9212. info@buckwheatgrowers.com www.buckwheatgrowers.com

Cashton Farm Supply (CFS) Specialties, Inc. 199 Front St., Cashton, WI 54619. (608) 654-5123 or (800) 822-6671. www.cfspecial.com Supplier of organic poultry feed.

Cornerstone Farm Ventures. 242 Dan Main Road, Norwich, NY 13815. (607) 334-3231. Supplies mobile processing units for poultry.

Eggcartons.com

Equipment Exchange Company of America, Inc., 10042 Keystone Dr., Lake City, PA 16423. (814) 774-0888. www.eeclink.com Offers used equipment.

Fastline, PO Box 248, Buckner, KY 40010. (800) 626-6409. www.fastline.com Dealer for new and used agricultural equipment.

Fleming Outdoors, PO Box 147, Ramer, AL 36069. (800) 624-4493. info@flemingoutdoors.com Sells range of poultry equipment.

Helfter Feeds, Inc. 136 N. Railroad, PO Box 266, Osco, IL 61274-0266. (866) 435-3837. www.HelfterFeeds.com Supplier of organic poultry feed.

Jako, Inc., 6003 E. Eales Rd., Hutchinson, KS 67501. (877) 525-6462. ken@jakoinc.com www.jakoinc.com/fencing.shtml Poultry processing and fencing supplies.

Kings Supply, 24 Holt Rd., Manchaug, MA 01526-0302. (888) 852-5340. www.eggcartons.com Processing and production equipment, marketing supplies.

Koch Supplies, 1411 West 29th St., Kansas, MO 64108. (800) 777-5624. www.kochequipment.com Sells processing, packaging, and labeling supplies.

Kreamer Feed Inc., Box 38, Kreamer, PA 17833-0038. (800) 767-4537. Luke.Howard@kreamerfeed.com www.kreamerfeed.com Supplier of certified organic and noncertified poultry feed and scratch.

Latco Headquarters, Sales Office/Production Facilities, Highway 62 East, Lincoln, AR 72744. (800) 824-2599. info@latcoinc.com www.latcoinc.com Designs, manufactures, and constructs poultry and cage layer housing.

Metzer Farms, 26000 Old Stage Rd., Gonzales, CA 93926. (800) 424-7755. www.metzerfarms.com

National Poultry Equipment Company/Barlar Industries, 3290 Lancer Ave., Osage, IA 50461. (641) 732-1460. www.nationalpoultryequipment.com

Pickwick Zesco, 7887 Fuller Rd., Suite 117, Eden Prairie, MN 55344. (800) 808-3335.

The Upper Midwest Organic Resource Directory, 4th Edition. MOSES. Updated annually. www.mosesorganic.org. Directory of feed and equipment suppliers as well as resource organizations. Available from MOSES (see *Agencies and Organizations*).

Wisconsin Poultry and Egg Directory. Department of Agriculture, Trade and Consumer Protection, Wisconsin Department of Agriculture. 1999. Lists buyers, distributors, hatcheries, processors, producers, retailers, and wholesalers. Available from Wisconsin Farm Center, Wisconsin Department of Agriculture, Trade & Consumer Protection (see *Agencies* and *Organizations*).

GLOSSARY

All-in-all-out. A flock of birds enters and exits a facility as a single group. New members are not introduced and flocks are not mixed. This strategy minimizes the risk of new members introducing disease to a flock.

Antibiotic. A soluble chemical produced by a microorganism or fungus and used to destroy or inhibit the growth of bacteria or other microorganisms.

Ascites. Accumulation of fluid in the abdominal cavity.

Biosecurity. Using a range of management, environmental, pharmaceutical, and other precautions to protect the flock from infectious disease.

Black-skinned. Birds with black skin. One example of black-skinned chickens consumed by some ethnic groups is the Australorp. This chicken has black feathers and black skin on the feet — but the actual skin of the carcass is not black. The Silkie chicken, however, has black skin throughout the body. It also has black meat and black bones.

Breast blisters. (also called keel cyst) An enlargement of the sternal bursa on the keel of chickens and turkeys appearing as abscess-like fluid-filled sacs found on the breastbone. The primary cause is thought to be prolonged or repreated pressure or friction on the keel bone caused when the chickens or turkeys spend considerable amount of time resting on their breast bone.

Breed. A group of fowl/birds related by ancestry and breeding true to certain characteristics such as body shape and size.

Broiler. Fast-growing chicken raised for meat.

Brooder. Heat source for starting young birds.

Cannibalism. Toe picking, head picking, feather picking, and vent picking.

Capon. Castrated male fowl having undeveloped comb and wattles, and hackles, saddles and tail feathers that are longer than in a normal male.

Captive game. Fowl for which there is an established hunting season. Examples include pheasant and quail.
Carcass. All edible parts of a slaughtered animal, including edible viscera.

Closed flock. Flock that has not had direct or indirect contact with other birds.

Complete feed. Nutritionally balanced feed mixed for individual species and stage of production.

Custom exempt. Processing or slaughter that is exempted from continuous federal and/or state inspection. Meat processed at custom exempt plants can be consumed by the owner, the owner's immediate family, and non-paying guests. It cannot be retailed.

Day-old chicks. Chicks that have hatched and are one day old.

Day-range management. Similar to free range, but birds are confined at night for protection from predators.

Free-choice. Method of feeding whereby birds have continuous access to feed.

Free range management. Nonconfinement production alternative allowing birds to forage freely day and night. A perimeter fence is used to deter predators.

Hen. Mature, female fowl (usually 12 months or older) that has begun laying eggs.

Induced molt. A flock of hens is induced into a group molt with an accompanying cessation of egg production. This process results in rejuvenation of the flock and increase in egg production and improvement in egg quality.

Industrial management. Producing large numbers of birds using confinement style housing, often under contract with an integrator.

Integrator. A company that owns or controls multiple stages of production such as breeding, hatching, grow-out, and processing.

Intermediary. Company or buyer who arranges for final sale of product. Intermediary examples include wholesalers and retailers.

Keet. Young or immature guinea fowl.

Litter. Soft, absorbent material used to cover floors of poultry houses.

GLOSSARY

Meat. Edible muscle and other edible parts of a food animal, include edible skeletal muscle, edible organs, and edible muscle found in the tongue, diaphragm, heart or esophagus.

Medicated feed. Feed that includes low levels of antibiotics to prevent common poultry diseases.

Minimally processed. A process which does not fundamentally alter the raw product (USDA definition).

Molt. To shed old feathers and grow new ones.

Muscovy. Species originating in South America. Commonly and incorrectly referred to as a duck. Breeding a Muscovy with any other duck will result in infertile offspring (called "Mule Ducks").

Natural. A product containing no artificial ingredient or added color and is only minimally processed (USDA definition).

Nest run. Eggs that are not graded or sized.

Omega-3. A beneficial fatty acid that originates in green plants.

Organic management. Adherence to USDA National Organic Program standards.

Pasturage. Grass, legumes, insects, worms, and seeds consumed by birds when foraging.

Pasture. Field seeded and maintained for livestock foraging.

Poult. Immature turkey.

Poultry. Domesticated fowl commonly used for human food, fiber (e.g., feathers or down) or entertainment (e.g., homing pigeons). Includes domesticated chickens, turkeys, geese, ducks, guinea fowl, pigeons, etc.

Poussin. A very young chicken that has a delicate flavor and little fat.

Process. Cut, grind, manufacture, compound, intermix or prepare meat or meat food products.

Product identity. The name of the product, a complete list of ingredients and the name, address, and zip code of the manufacturer or distributor (MN).

Pullet. Young female hen that has not begun laying market quality eggs.

Ratite. Member of the group of flightless birds that includes ostrich, emu, cassowary, kiwi, and rhea.

Restricted feed. Access to feed is limited or tightly controlled; no "free access" or continuous feeding.

Ridges. Wrinkles or weak spots on egg shells caused by excess calcium depositing. Eggs with wrinkles are more likely to crack and become contaminated.

Roaster. Young chickens of either sex, usually 3-5 months of age, that are tender-meated with soft, pliable, smooth-textured skin and with a breastbone and cartilage somewhat less flexible than the broiler.

Roost. A perch on which birds rest or sleep.

Scratch. Cheap or broken grain scattered on ground. Considered a "filler" food that is not formulated to meet birds' complete nutritional requirements.

Sex-link. A trait that is linked to the sex of the bird. Sex-linked feather color traits are sometimes used to allow sexing of offspring.

Squab. A 25-30 day old pigeon (nestling) before it learns to fly. Live weight averages 20-24 ounces. Dressed weight is 14-16 ounces. Meat is dark with a rich and somewhat wild flavor. Considered a "gourmet" meat bird.

Straight-run. Hatchlings that are not sexed.

Traditional management. Confinement or semi-confinement production for small- to medium-sized flocks.

Transitional feed. Feed that is produced using organic management practices but that has not yet received certification.

Vertical integration. One company owns more than one stage of production such as breeding, hatching, grow-out, and processing.

Waterfowl. Birds that naturally spend most of their lives on and near water such as ducks and geese.