

Professional Agricultural Workers Journal

Volume 9
Number 1 *Professional Agricultural Workers
Journal (PAWJ)*

Article 2

10-28-2022

Establishing a Small-Scale Pastured Poultry Operation in Kentucky

Frederick N. Bebe

Kentucky State University, Frankfort, Kentucky, frederick.bebe@kysu.edu

Follow this and additional works at: <https://tuspubs.tuskegee.edu/pawj>



Part of the [Agricultural Economics Commons](#), and the [Poultry or Avian Science Commons](#)

Recommended Citation

Bebe, Frederick N. (2022) "Establishing a Small-Scale Pastured Poultry Operation in Kentucky," *Professional Agricultural Workers Journal*: Vol. 9: No. 1, 2.

Available at: <https://tuspubs.tuskegee.edu/pawj/vol9/iss1/2>

This Article is brought to you for free and open access by Tuskegee Scholarly Publications. It has been accepted for inclusion in Professional Agricultural Workers Journal by an authorized editor of Tuskegee Scholarly Publications. For more information, please contact kcraig@tuskegee.edu.

ESTABLISHING A SMALL-SCALE PASTURED POULTRY OPERATION IN KENTUCKY

Frederick N. Bebe¹

¹Kentucky State University, Frankfort, Kentucky

*Email of author: frederick.bebe@kysu.edu

Abstract

Pastured poultry is poultry rotationally raised on pasture, as opposed to large-scale confinement operations. There has been a growing demand for pastured poultry as a result of the adverse effects of the use of antibiotics in large-scale caged systems and pastured poultry's attributable nutritional and economic benefits to consumers. As a result, an increasing number of small-scale farmers in Kentucky have begun raising birds both for personal consumption and for supplemental income, in conjunction with other farm enterprises. Poultry is the number one agricultural commodity in Kentucky. Thus, knowledge of how to establish small-scale pastured poultry operations as an alternate or complementary business in Kentucky can be beneficial to potential as well as existing farmers. Beginning producers can develop a plan of operation based on available resources by establishing a budget and nutritional plan, designing appropriate housing, and familiarizing themselves with local, state, and federal policies and regulations.

Keywords: Pastured Poultry Production, Pastured Poultry Operation and Processing, Small-Scale Pastured Poultry Operation

Introduction

Pastured poultry has been around as long as farming has. Today, with an increase in population and new technologies, large-scale confinement operations supply most of our meat and eggs. However, the past few decades have witnessed the rebirth and increasing popularity of small-scale pastured poultry farming, partly due to the adverse effects of the use of antibiotics in large-scale confined poultry operations. Pastured poultry is poultry raised on pastures. The poultry is rotationally grazed in a sustainable practice that entails raising the birds with limited confinement, allowing them to feed on grass, bugs, and other organic material that they otherwise would not get in large confinement operations (Burbaugh et al., 2010; Sossidou et al., 2011). The birds are often housed in floorless mobile pens/coops with nesting placements and perches. The mobile housing allows farmers to move the poultry to different pasture locations. It is important to be able to rotate the poultry from one fresh pasture to another to give grazed pastures time to recover.

The importance of the poultry industry in Kentucky is exemplified by the fact that poultry is the number one agricultural commodity, as well as the number one food commodity. In 2020, the state of Kentucky produced 1.6 billion eggs. Poultry and eggs are a \$1 billion industry. They account for over 20% of the state's total farm receipts (Kentucky Poultry Industry Facts, n.d.) Kentucky became a leader in the poultry industry with the decline of tobacco farming, as many local tobacco farmers turned to poultry production to diversify their operations. Records of the number of registered pastured poultry farms in Kentucky are hard to find, partly because most producers are small, limited-resource farmers who raise birds in conjunction with other farm enterprises as a source of supplemental income. There are more than 850 poultry farms in 42 counties in Kentucky, and the average poultry farm is family-owned and operated (University of Kentucky Cooperative Extension Service [UKCES], n.d). According to the United States Department of Agriculture

[USDA] (n.d.), a small-scale farm is that which sells less than \$250,000 in agricultural products annually. It is suggested that Kentucky is among the top states with a large number of small poultry farms of less than 3,000 birds, with the greatest access to pasture (Lockman, 2016). Growth is expected to continue despite the pandemic.

Benefits of Pastured Poultry

Knowledge of the benefits of pastured poultry would be helpful to small farmers who desire to diversify their operations. Increasing demands for pastured poultry are linked to its health or nutritional, environmental, and economic benefits. Pastured poultry offers many benefits to the sustainable farm, such as supplying eggs and/or meat, enhancing soil fertility, and controlling weeds and insects. Growth on pastures is healthier for chickens and for consumers who eat pastured poultry products because the pastured birds eat grasses and legumes that contain vitamins, fatty acids, and nutrients that are commonly known to reduce cholesterol (Bare and Ziegler-Ulsh, 2019; Burbaugh et al., 2010). Also, small-scale pastured poultry operations give chickens a more natural and humane life compared to large confinement operations where they live out their lives in cages. Confining chickens to a fixed area can cause irritation, stress, and hardship to the flock, giving rise to the spread of infections and diseases. The birds that have access to fresh pasture on a rotational basis tend to be “healthier and happier,” as they have ample space, fresh air, and direct sunlight, allowing them to express natural behaviors (Fanatico, 2006; Sossidou et al., 2011). Consequently, consumers are provided with a better product.

Pasture and poultry are said to be mutually beneficial. Pastured poultry provides significant benefits to soil health. Birds released into a pasture provide manure that is distributed back into the soil, creating rich nutrients for grass and crops to utilize (Starmer, 2019). Placing chickens in the same pasture as cattle will allow the chickens to feed on the unwanted insects that could possibly cause illness to the herd. Thus, pastured poultry production is a sustainable system that can integrate with other species in diversified livestock production systems, creating additional revenue for limited-resource farmers (Sossidou et al., 2011).

Raising chickens can be very profitable as a “niche market” for a naturally and humanely raised protein source. Pastured poultry can also intensify and transform a farm operation by providing several income resources at low cost in terms of investment for shelters, labor, and equipment (Bare and Ziegler-Ulsh, 2019). Family, social, or communal benefits of pastured poultry have been reported to enhance farmers’ lifestyles, due to savings in labor, feed, and processing costs (SARE, 2012).

In addition, pastured poultry offers many investment opportunities and can also be easy to learn. Establishing a small-scale pastured poultry operation in Kentucky is feasible for anyone, but proper planning and knowledge of the animals is required to be successful. Before setting up a small-scale operation, it is necessary to first establish a budget based on available resources, develop a plan of operation, choose a breed, formulate a nutrition plan, design housing, and research policies and regulations in the area or county of operation (Bare and Ziegler-Ulsh, 2019).

Goals, Resource Assessment, and Budgeting

Having the correct resources, proper funding, and a distinct plan are important parameters for success. When planning for pastured poultry production, it is important first to make a list of resources available and needed, and to decide on the type of production – organic or non-organic. Such a list will help in determining how much financial help will be needed, as well as the size and location of the operation. The first step in establishing a small-scale pastured poultry operation is to clearly define your goal or goals. It is necessary to ask questions, such as: What do I want out of the business? How much time can I devote to it? How much money do I have in hand to invest in the operation? (Bare and Ziegler-Ulsh, 2019).

Assessing available resources would include evaluating labor costs, cash on hand, and existing structures. If operating on your own, then your labor costs will be zero. However, if planning a large enough operation, hired labor has to be taken into account. Cash on hand is the amount of personal funds available to invest in the business. Start-up funds can be acquired. Kentucky State University Cooperative Extension Program [KSUCEP] offers grants for small-scale operations (KSUCEP, n.d). Small-scale farmers can cut down on costs by using existing capital assets such as barns, equipment, and other materials. When operational, other enterprises may benefit from chicken waste as fertilizer, thus further reducing costs (Bare and Ziegler-Ulsh, 2019).

Breeds

The next decision a beginning small-scale pastured poultry farmer has to make is whether to pasture layers, broilers, or both, as each has a different diet, shelter, costs, and management requirements. Layers are the common name for farming egg-laying birds. When choosing a breed of layers, the frequency of egg laying, mothering capabilities, and the number of eggs laid year-round are important parameters to consider. The most popular layer breeds include Rhode Island Red, Leghorn, Plymouth Rock, Ancona, and Minors. Broilers are meat chickens. The choice of breed for meat chicken depends on the size of the bird and the ability to put on weight quickly and efficiently. Cornish Cross, Delaware, and Java fall under this category. Dual-purpose breeds are breeds that are good for both meat and egg production. The most popular dual-purpose breeds are Australorp, Barred Plymouth Rock, Delaware, Java, New Hampshire, Rhode Island Red, and White Wyandotte (Bare and Ziegler-Ulsh, 2019).

Nutrition Plan

Nutrition is a key factor in the efficient production of poultry. All nutritional requirements must be met in order to maintain a healthy flock. Farmers can buy pre-mixed feed that contain all required ingredients or mix their own feed. It is usually cost-effective to mix one's own feed, and more so if farmers form cooperatives for acquiring the necessary equipment and skills. Feed cost is important in deciding whether to choose organic or non-organic production. The high cost of organic feed may be out of reach for small-scale farmers. In a budget enterprise analysis of organic pastured poultry production, Painter et al. (2015) reported organic feed costs of over 250% compared to that of non-organic feed.

Poultry diets are composed of a variety of different feed ingredients mixed in specific proportions to provide the birds' needs for energy, protein, vitamins, and minerals. No single feed ingredient meets the nutrient requirements of a flock. Grains are the main ingredient in poultry diets for energy. Corn is the most common grain used in Kentucky and many parts of the United States

because of its low price and availability. Others include barley, buckwheat, oats, pearl millet, quinoa, rye, sorghum, triticale, and wheat (Jacob, 2022a). Soybean meal is the main protein source for poultry diets. Other sources include lupine, soybeans, sunflower seeds, and canola meal (Jacob, 2022a). Also, balanced diet research-based growth management and feed consumption recommendations for small-scale broiler and layer operations in Kentucky are reported by Jacob and Pescatore (2012).

Micro-ingredients include the essential vitamins and minerals needed to achieve maximum health and performance for poultry. Chickens only produce Vitamin C, so all others must be introduced into their feed. Minerals needed in poultry diets are typically classified as macro- or micro-minerals. The macro-minerals, which include calcium and phosphorus, are added as separate ingredients. Micro-minerals, such as zinc, copper, iron, magnesium, potassium, etc., are typically added in a micro-mineral premix (Jacob, 2022a).

Feed additives are also frequently used in poultry diets. Some are used daily, while others are used as needed. Some common additives include natural antimicrobials, enzymes, and antioxidants. Antioxidants are added to poultry feed to increase energy content, especially in broiler diets. Enzymes are added to the diet to break down anti-nutritional factors. Natural antimicrobials, such as prebiotics, probiotics, and phytobiotics, are added for disease prevention, to keep the bad microbes in check, and to increase gut health (Jacob, 2022b).

Pastured poultry husbandry knowledge and skills that include a choice of pasture and good pasture management are important for the maximum performance of layers and broilers. Identifying and planting the best forages nutritionally could lead to significant substitution for feed and improved profits (Fukumoto and Replogle, 1999). Pastures grazed by poultry must be well-drained and the pens protected from rain and wind. Birds should be placed on pasture at an appropriate age (about 2-3 weeks of brooding), without overcrowding them, making sure they have fresh and clean water daily. It is of utmost importance to prevent feed from getting wet, as wet feed can mold and develop mycotoxins that can cause disease. Thus, feeders and waterers must be adjusted regularly, as the birds get older (Skelton et al., 2012).

Meanwhile, weather conditions dictate the frequency with which tarps should be adjusted to increase or decrease ventilation in the pens. Most importantly, good pasture management requires that poultry pens be moved frequently to avoid the build-up of manure and bacteria that can adversely affect the health of the birds. Depending on the age and stocking rate, broilers can be moved every other day for the first 2 weeks on pasture, daily for another 2 weeks, and twice a day until they attain market weight, while layers should be moved to new pasture sites daily. Pastures should be allowed to fully recover and not overgrow before the birds are rotated to them a second or more times (Skelton et al., 2012). Below is a typical grazing rotation diagram for broiler chickens (Figure 1).

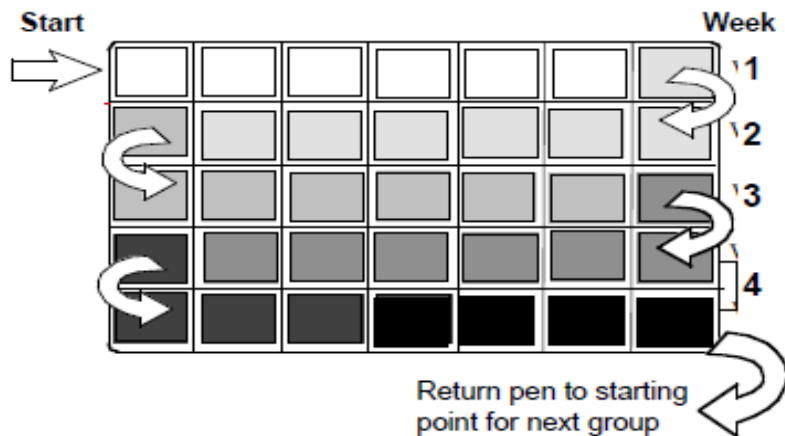


Figure 1. A 28-day grazing rotation for broiler chickens. A chicken tractor or “carport” is moved daily the first 2 or 3 weeks and twice daily on week 4 (Curtesy, Fukumoto and Replogle, 1999).

Potential Profit

Potential profits from pastured poultry vary. Beginning farmers should familiarize themselves with a number of online budget tools, which have been developed to estimate the economic return from pastured poultry operations. These tools could calculate revenue in terms of the number or weight of birds sold per year, including revenue from eggs and manure sales, taking into consideration not only cost of chicks, feed, medication, bedding, paid labor, and processing, but also marketing, capital investment, equipment depreciation, and the value of unpaid labor (SARE, 2012). A study by the Center for Integrated Agricultural Systems [CIAS] (2001) of five farms that raise poultry on pasture reported significant profits for growers who incorporate poultry into diversified farms. However, improved profits come with management experience and an established niche market or customer base, most often through on-farm, farmer’s market, or restaurant direct marketing that includes other farm produce.

In a study conducted on the cost of broiler operations for small-scale farms, Dasgupta and Bryant (2016) reported that farmers who used management recommendations on growth and feed intake by Jacob and Pescatore (2012) obtained an average production cost of fewer than ten dollars per bird. Dasgupta and Bryant not only recommended a high level of management using their enterprise budget as a guide, but also factor labor, processing, and market-related costs in determining whether to start a pastured poultry operation. A similar poultry enterprise calculator option that could be adopted is that of the CIAS.

Housing

Choosing or designing housing for birds is another important decision for small-scale pastured poultry producers. The best housing option will depend on the size and topography of land available, and the budget and goals of the enterprise. However, the selected site or land space should be relatively flat and well-drained. Farmers can design their own housing or select from pre-designed systems.

There are at least five known housing types currently in use, all of them a modification of Joel Salatin's pioneering design (SARE, 2012; Bare and Ziegler-Ulsh, 2019). These are (1) Floorless Pastured Poultry Pens that are usually moved to fresh pasture daily; (2) the "Net Range" (or "Day Range") made up of movable housing with shelter access for feeding, rest, and shade against predators and inclement weather; (3) Free Range Systems that allow birds to range freely, returning to portable housing units in the evening or during unfavorable weather conditions; (4) Yarding System where birds are kept in permanent housing but allowed to pasture during the day, and (5) the bottomless Chicken Tractor Model, in different sizes with complete feeding and watering accessories. The chicken tractor may be designed with wheels or sliding material to be easily moved to different pasture locations daily (SARE, 2012). Figure 2 shows a chicken tractor model, or "carport" high enough for easy in and out walking, and good airflow with hanging feeders and waterers easily moved by a tractor for broiler production at the KSU Harold R. Benson Research and Demonstration Farm.



Figure 2. Broiler Chickens in pens on pasture at KSU's Harold R. Benson Research and Demonstration Farm

Cage-free housing or outdoor systems (as they are often called) allow for full expression of bird behavior and a more natural lifestyle for the flock. Unlike in caged systems, the birds are able to lay eggs in nests, forage and eat bugs from the ground in a more natural environment. According to the Rodale Institute (Bare and Ziegler-Ulsh, 2019), about 2.0-2.5 square feet of space is needed per bird in penned outside access.

No matter which system is chosen, there is a need to include ventilation, insulation, walls, roofs, nests, and roosts. Insulation is required during cold periods, and roofs need to be waterproof. Choosing the right housing under the right conditions can help prolong the life of pastured poultry and keep them producing efficiently (Bare and Ziegler-Ulsh, 2019). The construction of a chicken tractor model or hoop pen model could be helpful to beginning pastured poultry farmers, as detailed in a UKCE publication (Skelton et al., 2012). Cage-free and outdoor systems are not without disadvantages. The birds may be susceptible to predators, diseases, cannibalism, and even broken bones. Compared to conventional confinement operations, pastured poultry systems have been reported to have a higher mortality rate (Lay, 2011).

Flock Health, Product Safety, and Processing

Raising poultry on pasture for home consumption or for profit requires a commitment in disease prevention. The ability to prevent disease comes with experience. However, for the beginning farmer, it is important to have a basic knowledge of poultry diseases so that they can be prevented at an early stage. There are many diseases in poultry that are capable of killing an entire flock. The four main categories are bacterial, viral, and internal and external parasitic diseases. Bacterial diseases are caused by bacteria, such as *Escherichia coli* and organisms of the genus *Mycoplasma*, that may result in severe and chronic respiratory problems. Parasitic diseases are caused by parasites entering the body. The most common internal and external parasites are ascarids, tapeworms, poultry mites, and lice. Viral diseases occur when the birds are infected with viruses that cause respiratory disorders such as Avian pox and Newcastle disease (Diseases of Poultry, n. d.).

The availability of licensed processors is one of the biggest obstacles to small farmers making extra income from pastured poultry (CIAS, 2001). When establishing a pastured poultry operation, arrangements for the processing of the birds must be done in advance. Kentucky small-pastured poultry farmers form cooperatives to either purchase or rent a Mobile processing unit (MPU) as a solution to the lack of large-scale operators ready to work with independent farmers. This enables them to comply with strict federal and state regulations on livestock processing. Pastured poultry farmers in communities with docking stations, electricity, and potable water can request the use of available MPUs at a discounted rate and share the cost of processing. These MPUs have built-in scalding, washing, plucking, and packaging equipment. Some federally inspected processing plants are usually reluctant to process birds from independent farmers who may not meet their processing volume, while the cost of processing may be prohibitive for some. Some of these units are exempt from federal (USDA) inspection but are subject to local and state health and sanitation regulations. This opens up the “doors to the marketplace” for small, limited resource farmers who otherwise may not be able to compete with large-scale producers (SARE, 2012).

If considering on-farm processing, the following is typically needed (SARE, 2012): kill cones, a scalding tank to loosen feathers, a plucker to remove feathers, stainless-steel tables for evisceration, running water for washing, plastic or stainless-steel tanks to chill the carcasses prior to packaging, and supplies of sharp knives, bags, ice and gloves (SARE, 2012). Live chickens can be sold to customers, but these birds cannot be processed on farms. The buyer has to take them home to butcher them. Also, to add value to birds for sale in urban or farmers’ markets, or across state lines, farmers must have their birds butchered at a federally inspected plant or state-certified processing plant. KSUCEP operates a USDA-inspected and state-licensed MPU that is rented out to groups of small farmers that meet operational conditions (Figure 3). The USDA Food Safety Inspection Service has created a Mobile Slaughter Unit Compliance Guide for those who wish to be USDA regulated. Whether regulated or unregulated, the MPU may be an affordable and efficient solution to add value to small flock production (O’Bryan et al., 2014).



Figure 3. Kentucky State University Mobile Processing Unit (<https://www.kysu.edu/news/2017/11/kentucky-state-university-mobile-chicken-processing-unit-one-of-few-in-the-country.php>)

For over 20 years, KSU's MPU has been helping small-scale poultry farmers get their products into the hands of consumers. The MPU is a 20-foot-long, farmer-friendly processing facility on wheels with hot water heater, water lines and electricity. It can be transported to other locations, with approved docking stations – a huge benefit for farmers who can process 100 birds for \$134.50. There are at least four approved docking stations available in Kentucky: the KSU Harold R. Benson Research and Demonstration Farm, the Morehead State University farm, the Jackson County Food Kitchen, and the Laurel County African American Heritage Center. These docking stations are subject to inspection by local, state, and federal officials at any time without notice. Other USDA-inspected and/or state-licensed poultry processing facilities include the Central Kentucky Custom Meats Inc., the Marksbury Farm Market, and SS Enterprises of Warren County (Ellis, 2021).

Policies and Regulations

There are a lot of policies and regulations placed on food production in the United States by both the USDA and the Food and Drug Administration (FDA). Transparency in the food industry allows consumers to build trust in the poultry industry and to make better decisions for their families. Farmers who raise poultry on pasture for personal consumption do not have to worry about most of the rules and regulations; otherwise, all guidelines put in place by federal and local authorities have to be followed.

Marketing regulations affecting small-scale egg producers in Kentucky can be found in a publication by the UKCES. These policies include the safe handling of eggs, packaging, labeling, and refrigeration. In addition, the Kentucky Department of Agriculture requires each producer to have an Emergency Recall Plan that contains policies and procedures to be followed in the event of a recall of eggs (Jacob & Pescatore, 2018). Likewise, the disposal of carcasses in the case of infectious disease is governed by statutes and regulations of the Kentucky Departments of Agriculture and Environmental Protection [KDA/KDEP], and includes on-site burial, composting, and landfilling (KDA/KDEP, 2015).

Conclusion

Pastured poultry operations are becoming increasingly popular in the United States and all around the world. Consumers' demand for pasture-raised poultry for meat and eggs has given rise to an increase in small-scale, limited-resource pastured poultry farmers in Kentucky. With proper knowledge, guidance, and planning, anyone can start their own operation if they take the necessary steps. Having the correct resources, proper funding, and a distinct plan can offer instant income. When planning for pastured poultry production, it is important first for the producer to make a list of resources needed and to decide whether he or she wants to go into organic or non-organic production. Such a list will help in determining how much financial help will be needed, the farm location, and the type of production. Other important requirements when it comes to establishing a small-scale pastured poultry operation include establishing a budget, choosing a breed, designing housing, and making nutritional plans. Proper planning and knowledge of the animals are also needed to be successful. Above all, it is crucial that state regulations and policies are understood before producers start the operation. It may be helpful to gain some personal experience from working in or visiting some pastured poultry operations before deciding to start one. Small-scale pastured poultry production does not require expensive equipment or structures. It is a low-input and sustainable option for beginning farmers and potential for diversification and additional income in established farming operations.

Acknowledgment

The author acknowledges senior students, Michaela Mccane and Regan Sutton, whose class projects formed the basis for this paper.

References

- Bare, M., and C. Ziegler-Ulsh. (2019). "How to Establish a Small-Scale, Pastured Poultry Operation." <https://rodaleinstitute.org/blog/how-to-establish-a-small-scale-pastured-poultry-operation/> [Retrieved March 15, 2022].
- Burbaugh, B., E. Toro, and A. Gernat. (2010). *Introduction to Pasture-Raised Poultry: Maximizing Foraging Behavior*. Bulletin Number An237. <http://ufdcimages.uflib.ufl.edu/IR/00/00/37/72/00001/AN23700.pdf> [Retrieved February 20, 2022].
- CIAS, (2001). *CIAS Research Brief #57*. <https://cias.wisc.edu/2001/10/01/raising-poultry-on-pasture/> [Retrieved February 20, 2022].
- Dasgupta, S., and R. Bryant. (2016). "Costs of Pastured Broiler Operations Based on Data from Small-Scale Farms." *Journal of Extension* 54 (5): v54 <https://tigerprints.clemson.edu/joe/vol54/iss5/10>
- Diseases of Poultry. (n.d.). "Livestock and Poultry Diseases" <http://extension.msstate.edu/agriculture/livestock/poultry/diseases-poultry> [Retrieved Feb 20, 2022].
- Ellis, K. (2021). "Small Poultry Processing Plants and Services." https://attra.ncat.org/attra-pub/poultry_processors/ [Retrieved February 23, 2022].
- Fanatico, A. (2006). "Alternate Poultry Production Systems and Outdoor Access." <https://attra.ncat.org/wpcontent/uploads/2019/05/poultryoverview.pdf> [Retrieved February 20, 2022].

- Fukumoto, G. K., and J. R. Replogle. (1999). "Pastured Poultry Production: An Evaluation if its Subsistence in Hawaii." <https://www.ctahr.hawaii.edu/oc/freepubs/pdf/LM-1.pdf> [Retrieved March 3, 2022].
- Jacob, J. (2022a). "Basic Poultry Nutrition." <https://poultry.extension.org/articles/feeds-and-feeding-of-poultry/basic-poultry-nutrition/> [Retrieved August 4, 2022].
- Jacob, J. (2022b). "Feed Additives for Poultry." <https://poultry.extension.org/articles/feeds-and-feeding-of-poultry/feed-additives-for-poultry/> [Retrieved August 4, 2022].
- Jacob, J., and T. Pescatore. (2012). "How Much will Chickens Eat?" Publication Number ASC-191. <http://www2.ca.uky.edu/agcomm/pubs/ASC/ASC191/ASC191.pdf> [Retrieved March 4, 2022].
- Jacob, J., and T. Pescatore. (2018). "Marketing Regulations Affecting Small-Scale Egg Producers in Kentucky." <http://www2.ca.uky.edu/agcomm/pubs/ASC/ASC229/ASC229.pdf> [Retrieved March 4, 2022].
- KDA/KDEP. (2015). "Poultry Disposal Guidance." <https://eec.ky.gov/Environmental-Protection/Compliance-Assistance/DCA%20Resource%20Document%20Library/PoultryDisposalFactSheet.pdf> [Retrieved April 10, 2022].
- Kentucky Poultry Industry Facts. (n.d.). <https://www.kypoultry.org/pfacts/> [Retrieved March 4, 2022].
- KSUCEP. (n.d.). "Small-Scale Farm Grants." <https://kysu.edu/academics/cafsss/cooperative-extension/small-scale-farm-grant-program/> [Retrieved March 20, 2022].
- Lay, D. C. (2011). Laying Hen Welfare Fact Sheet. Livestock Behavior Research Unit <https://www.ars.usda.gov/ARSUserFiles/50201500/> [Retrieved March 20, 2022].
- Lockman, C. (2016). "Poultry Ranks High Among Kentucky's Commodities and Exports." *KyFoodandFarm*. www.kyfoodandfarm.com/features/2016/3/16/poultry-ranks-high-among-kentuckyscommodities-and-exports [Retrieved March 20, 2022].
- O'Bryan C. A., P. G. Crandall, M. L. Davis, G. Kostadini, K. E. Gibson, Q. Q. Alali, D. Jaroni, S. C. Ricke, and J. A. Marcy. (2014). "Mobile Poultry Processing Units: A Safe and Cost Effective Poultry Processing Option for the Small-Scale Farmer in the United States." *World's Poultry Science Journal* 70 (4): 787-802
- Painter, K., E. Myhre, A. Bary, C. Cogger, and W. Jemmett. (2015). "Break-even Analysis of Small-Scale Production of Pastured Organic Poultry." A Pacific Northeast Extension Publication – University of Idaho, PNW 665. <https://www.lib.uidaho.edu/digital/uiext/items/uiext33178.html> [Retrieved April 18, 2020].
- SARE. (2012). "Profitable Poultry: Raising Birds on Pasture." <https://www.sare.org/resources/profitable-poultry/> [Retrieved April 20, 2020].
- Skelton, S., J. Jacob, and T. Pescatore. (2012). *Making a Hoop Pen for Pasture Poultry*. Bulletin ASC-189. <http://www2.ca.uky.edu/agcomm/pubs/ASC/ASC189/ASC189.pdf> [Retrieved April 20, 2020].
- Sossidou, E. N., A. D. Bosco, H. A. Elson, and C. M. G. A. Fontes. (2011). "Pasture-Based Systems for Poultry Production: Implications and Perspectives." *World's Poultry Science Journal* 67 (3): 47-58.

- Starmer, G. (2019). “Pastured Poultry Farming: Soil Health and Sustainability.” <https://www.thepoultrysite.com/articles/pastured-poultry-farming-soil-health-and-sustainability> [Retrieved April 20, 2020].
- UKCES. (n. d.). “Commercial Poultry Operations.” <https://afs.ca.uky.edu/poultry/extension-commercial-poultry-operations> [Retrieved April 18, 2020].
- USDA National Agricultural Library. (n.d.). Agricultural Farming Systems Information Center. https://www.nal.usda.gov/legacy/afsic/small-farms_[Retrieved April 20, 2020].