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Pastured Poultry Research

A publication of Truman State University Agricultural Science

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"Pastured Poultry" refers to any one of a number of production systems in which birds are allowed access to green, growing forage and insects to supplement their diet.

Pastured Poultry and Student Research at Truman

In the spring of 2001, Truman Agricultural Science student David Trott proposed a research project focused on pastured poultry. David had some experience with raising poultry in a Salatin-style pen on his family's farm, and wanted to test producer Joel Salatin's assertion that pastured poultry consume 30% less feed than conventional birds. Along with peers Justin Kelley and Jeff Cox and supported by Agriculture professor Dr. Michael Seipel, pastured poultry research at Truman State University began.

That initial, simple question about feed consumption has now expanded to include studies on feed conversion (pounds of feed consumed per pound of gain), comparison of different pastured poultry systems, foraging behavior, and more. We have also interviewed local poultry producers to gain insight into the challenges and rewards of pastured poultry in northeast Missouri, and incorporated some of what we learned into future research.

Cornish Cross Broiler in the Day-range system

As undergraduate students, we have had opportunities to present our research and findings all across the country, to a variety of audiences. We set up a display at a local foods festival in Kirksville, took a poster to a sustainable agriculture conference in Wisconsin, and even flew to Salt Lake City, Utah to present at a national research conference. Everywhere we have gone, we have found people interested in pastured poultry.

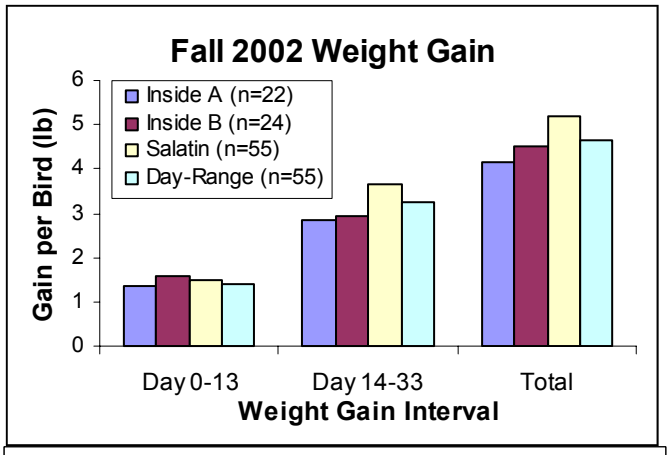
More than anything else, time spent with those who rely on pastured poultry to support themselves and their families made it clear that our studies have the potential for great impact on real people in a real world. Scientific evidence that input costs for pastured poultry are lower because less feed is needed and the housing can be built cheaply is helpful to those considering alternative production. Raising birds in a way that improves nutrients in the soil and does not lead to accumulation of manure, stream nutrification, and other negative environmental consequences will help preserve our countryside. We want to get the word out about pastured poultry, and it is our hope that this newsletter will help accomplish that goal.

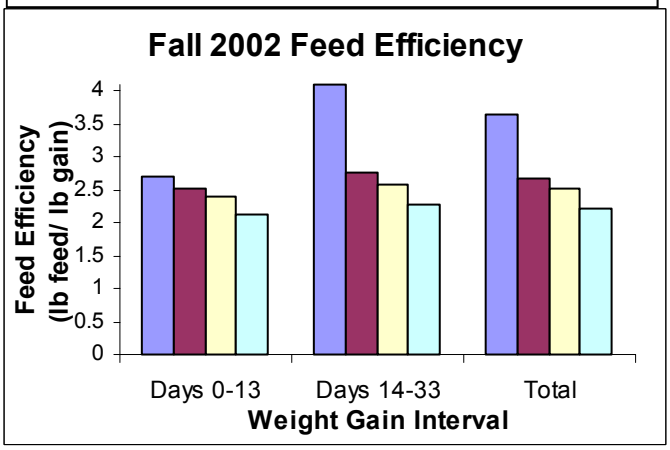
Salatin pen: 10' x 12' open-bottomed pen moved daily to fresh pasture. Pictured here with student David Trott.

The Research: Feed Efficiency and Weight Gain

We have completed three trials examining the amount of feed consumed by and total weight gain of Cornish Cross broilers in different production systems. The first two trials, conducted in the springs of 2001 and 2002, compared birds raised indoors on straw bedding to those raised in a Salatin-style pen, a 10'x12' open-bottomed pen moved daily. After interviewing local producers to learn about the methods they have employed most successfully, we decided to add a day-range group to our next trial. We constructed a chicken house on skids and used electric netting to form a "paddock" where the birds roamed during the day, then sheltered them in the house at night. The house was moved about every week to keep the ground around it from being too heavily trampled and provide fresh forage. An additional change for the Fall 2002 trial was using a high-legume alfalfa pasture for forage, in place of a mostly grass pasture. Also, in the spring of 2002, we had conducted fecal analyses of the different groups to check for any internal parasites. Finding none, we discontinued that aspect of the study.

The Salatin pen had the highest weight gain, but Day-range had the best feed efficiency





At three weeks of age, the broilers were weighed, banded, and assigned to a group (Indoor A, Indoor B, Salatin A, Salatin B, or Day-range). For the next month, feed consumption for each group was recorded and individual weights were taken at the middle and end of the trial. All birds had access to feed (15% protein mix of poultry crumbles and cracked corn) and water at all times. Average feed consumption was used to calculate each individual bird's feed efficiency (lbs. of feed consumed for every lb. of weight gained). In fall 2002, the Salatin pen had the highest weight gain (average 5.17 lbs), but Day-range had the best feed efficiency at 2.22 lbs. feed per lb. of gain. The next best group was the Salatin pen at 2.51, followed by Indoor B at 2.67 and Indoor A at 3.63. That large difference in feed efficiency between the two Indoor groups is why they were separated for analysis, instead of being combined like the Salatin pen subgroups.

Day-range system: semi-permanent floored pen with electric fence around a yard

Table 1 shows significant differences in feed efficiency between the groups as calculated by an ANOVA (Analysis of Variance) test. The numbers are the average feed efficiencies for each group, and the superscript letters define homogenous clusters. Different letters indicate different clusters; within each cluster there is no significant difference in feed efficiency. For example, in the "Total" column, Indoor A is in a cluster by itself, Indoor B and Salatin pen are in a cluster, and Salatin and Day-range are in a cluster. Therefore, there *is* a significant difference between Indoor A and any other group, and there *is* a significant difference between Indoor B and Day-range because they are not in the same cluster. There is *not* a significant difference between Indoor B and Salatin, however, and there is *not* a significant difference between the Salatin pen and Day-range.

Feed Efficiency= lbs of feed consumed per lb of weight gained

Table 1:Mean Feed Efficiency by Group: One-Way ANOVA Test With Tukey's HSD Post-Hoc

	Days 0-13	Days 14-29	Total
F-statistic	7.202, p<0.000	63.940, p<0.000	46.829, p<0.000
Indoor A	2.713[a]	4.091[a]	3.633[a]
Indoor B	2.532[a]	2.763[b]	2.666[b]
Salatin Pen	2.406[a,b]	2.566[b,c]	2.506[b,c]
Day-Range	2.134[b]	2.270[c]	2.217[c]

It's Not as Easy as it Looks!

Challenges of Pastured Poultry

As is the case with any research, we quickly ran into some of the pitfalls that accompany raising pastured poultry. One of the biggest problems was the unpredictability of spring weather in northeast Missouri. Our first two trials began in early April, and the cool temperatures and heavy rainfall (especially in Spring 2002) combined to produce high mortality among the young chickens. We determined that this was simply too early to put chickens outside, which led to the fall trial in 2002 and almost zero mortality. This is a prime example of one of the limitations of pastured poultry, that in cooler climates the birds can only be raised during the summer and early fall months. The Cornish Cross variety most commonly used is not very hardy and easily succumbs to illness or infection; however, varieties better able to withstand the elements may not gain weight as quickly or efficiently. Use of a day-range system with a floored chicken house helps keep the birds dry and may be better suited for cooler weather than the Salatin pen.

In cooler climates the birds can only be raised during the summer and early fall months.

The indoor control group, raised on a dirt floor covered with straw

An additional concern of many producers is processing of the birds. Many choose to do the processing themselves or with a co-op, but this can be difficult and the equipment is costly. We took our chickens to a local Amish family the first two years, but by fall 2002 Mid-Missouri's Poultry Processing Plant was open and we took our broilers to that facility.

Profiles of Northeast Missouri Pastured Poultry Producers

In an effort to learn more about pastured poultry and gain insights into ways to improve our research, Joy Chisholm, David Trott, and Dr. Michael Seipel visited several local operations in May of 2002. We interviewed the producers to learn how they raise, process, and market their poultry, as well as what concerns they have. The information, summarized below, helped us understand the issues facing producers and contributed to a few modifications to our research, including addition of the day-range group.

Producer	A	B	C	D
Farm Size	10 acres	20 acres	40 acres	2400 acres
Production Method	Salatin pen	Day-range	Day-range with permanent houses	Day-range
Number of Birds	3000/year 200/week	400/year in two batches	600-800/year in 3-4 batches	600/year in 6 batches
Cost per Chick	$0.52	$0.58	$0.60	$0.75
Type of Feed	19% protein Special recipe (corn, oats, kelp, Fertrell, soy oil)	18% protein Amish feed mill (corn, soybean meal, brewer's yeast)	18% protein crumbles and corn (50% of each at 6 weeks)	$^3/_4$ cracked corn, $^1/_4$ 20% protein mix
Feed Costs		$383 for 400 birds	$1.40 per bird	$2.20 per bird
Where Processed	On-farm: mobile processing trailer	Non-inspected processor ($1.35/bird)	On-farm: share plucker with other producers	On-farm: share plucker with another family
Selling Price	$1.45 per lb.	$6 per bird	$6 per bird	$7 per bird
Marketing Strategies	Referral rewards, newspaper ads, word of mouth	Flyers, bulletins, word of mouth	Word of mouth, sign at Farmer's Market	Word of mouth, some ads, free chickens for new customers

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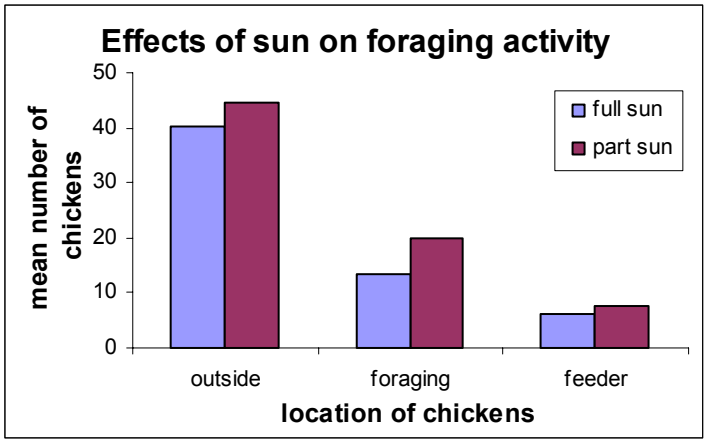
The Next Step: Nutritional Analysis

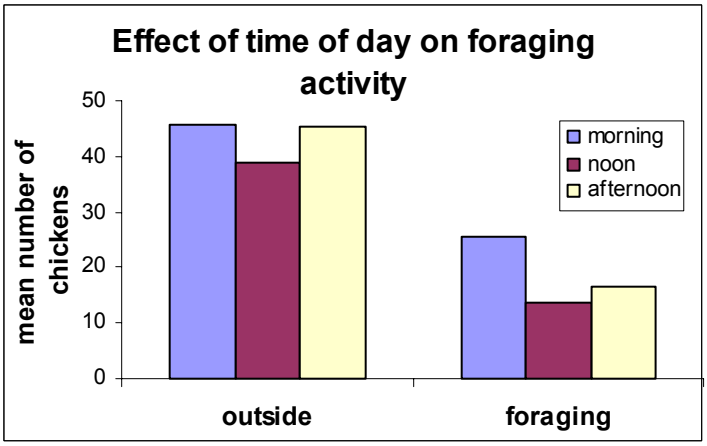
As the third trial drew to a close, we began to consider taking our research one step further by analyzing the meat of our broilers and comparing it to store-purchased, Tyson-brand chickens. We contacted two of Truman's Chemistry faculty who had worked with nutritional analysis of foods in the past and were interested in discovering any differences between the birds. If you are what you eat, then pastured poultry supplementing their diet with plants and insects should be different from chickens that only consumed feed. Our analysis includes the types and amount of fatty acids present, including the conjugated linoleic acids thought to be beneficial to the cardiovascular system, caloric content, vitamins, and overall protein content. In addition, the calcium content of the bones is being analyzed to determine if access to range affects bone density and structure. These studies are still in process and should be completed by early summer.

Strategies to Maximize Foraging: a Preliminary Analysis

One of the basic contentions behind all of pastured poultry is the assumption that the chickens, when given access to pasture, will in fact spend time foraging. In an effort to compile quantitative data on the behaviors of pastured chickens, we decided to record observations of the 56 chickens in the day-range system at different times of day and in varied weather conditions. At each observation, we counted the number of birds outside the house, the number actively foraging, the location of the outside birds (sun or shade), and the number of birds at the feeder. The observer also noted the time, amount of sun, and precipitation level, to determine any correlations between foraging behavior and environmental conditions. The observations were made over the 30-day period during which the birds were on pasture, from age 3 weeks to 7.5 weeks.

After analyzing the data, it appears that the amount of sun and the time of day have the greatest impact on the chickens' behavior.





During partial sun, the number of chickens outside (mean=44.51) and number foraging (mean = 20) were significantly higher than in full sun (means of 40.15 and 13.58, respectively). The feeder was nearly always surrounded, and there was no significant difference between full and partial sun. We also observed significantly higher foraging activity during the morning (7 a.m. to 10:59 a.m.) and afternoon (3 p.m. to 7 p.m.) than around the noon hour. Number of birds found outside in the morning was an average of 45.64 and in the afternoon 45.36, compared to only 38.94 around noon. There was significantly more foraging in the morning (mean = 25.43) than either around noon (13.53) or in the afternoon (16.4), probably owing partially to the fact that the birds were locked in the house all night. Based on these findings, producers wishing to reduce feed costs may seek to encourage foraging by providing shade and removing feeders in the morning, when birds are most likely to forage.