Feed Efficiency of Rainbow Broilers in Pastured Poultry Systems

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Background and Purpose

- Conventional poultry production methods involve the use of Cornish-Rock cross broilers in vertically integrated, confinement production operations
- Reduced market access for small and medium-sized producers
- Concerns over environmental degradation, meat quality and nutrition, and animal welfare
- For these reasons, some small farmers have turned to alternative poultry production methods

Why are Farmers Using Pastured Poultry Production Methods?

- There is increasing interest from consumers in the **health and animal welfare** aspects of alternative methods of production
- **Ecological and agronomic benefits** of alternative systems include eliminating concentrated poultry litter, improving soil fertility at low cost, and reducing parasites
- In addition, some sources claim **reduced feed costs** due to foraging by broilers

Alternative Systems Studies

- Studies on Conventional Broiler Production by the FDA, Univ. of California, AHI
- Authors and successful producers: Joel Salatin, Andy Lee, Herman Beck-Chenoweth
- Studies on Pastured Poultry by ATTRA, CIAS, University of Wisconsin, Madison
- Pastured Poultry Research at Truman State University (2001-present)

Pastured Poultry at Truman State University

- Four feeding trials using Cornish-Rock broilers have been conducted, comparing indoor, pasture pen, and day range systems.
- Summary conclusions:
  - Day Range broilers gained more efficiently (2.23 lbs feed/gain vs. 2.45 lbs feed/gain) than Pasture Pen
  - Pasture Pen broilers gained more total weight (4.98 lbs vs. 4.61 lbs)
  - Gain and Efficiency in outdoor systems were more variable depending on weather conditions compared to the indoor

Contribution of the current research:

- The Cornish-Rock cross has become the commercial industry's standard broiler chicken due to rapid growth, feed efficiency, and breast meat yield
- Therefore it was selected for use in initial Pastured Poultry trials.
- However, high mortality rates, structural deformities, susceptibility to disease suggested the need for alternative breeds for pastured production
- Rainbow Broilers are bred for more aggressive foraging, more adapted to inclement weather conditions, fewer leg problems (more normal growth curve, especially muscle to bone ratio)

Research Question

How does the feed conversion rate and total weight gain of "Rainbow broilers" compare across pastured poultry systems and with that of Cornish-Rock cross broilers?

Methods & Materials

- 88 Rainbow broilers chicks, both male and female, were evenly separated and raised in two pastured poultry systems:
  - Two groups outside in a 10’x12’ pasture pen
  - One group outside in a day-range system
- Each group was fed, *ad libitum*, a 18% protein ration of cracked corn and poultry crumbles.

Methods and Procedure

- Individual weights measured on days 1, 28, 42, and 70
  - Past trials: 4½ week trial with processing at 7 weeks of age
  - Fall 2003 trial: 10 week trial period with processing at 13 weeks of age

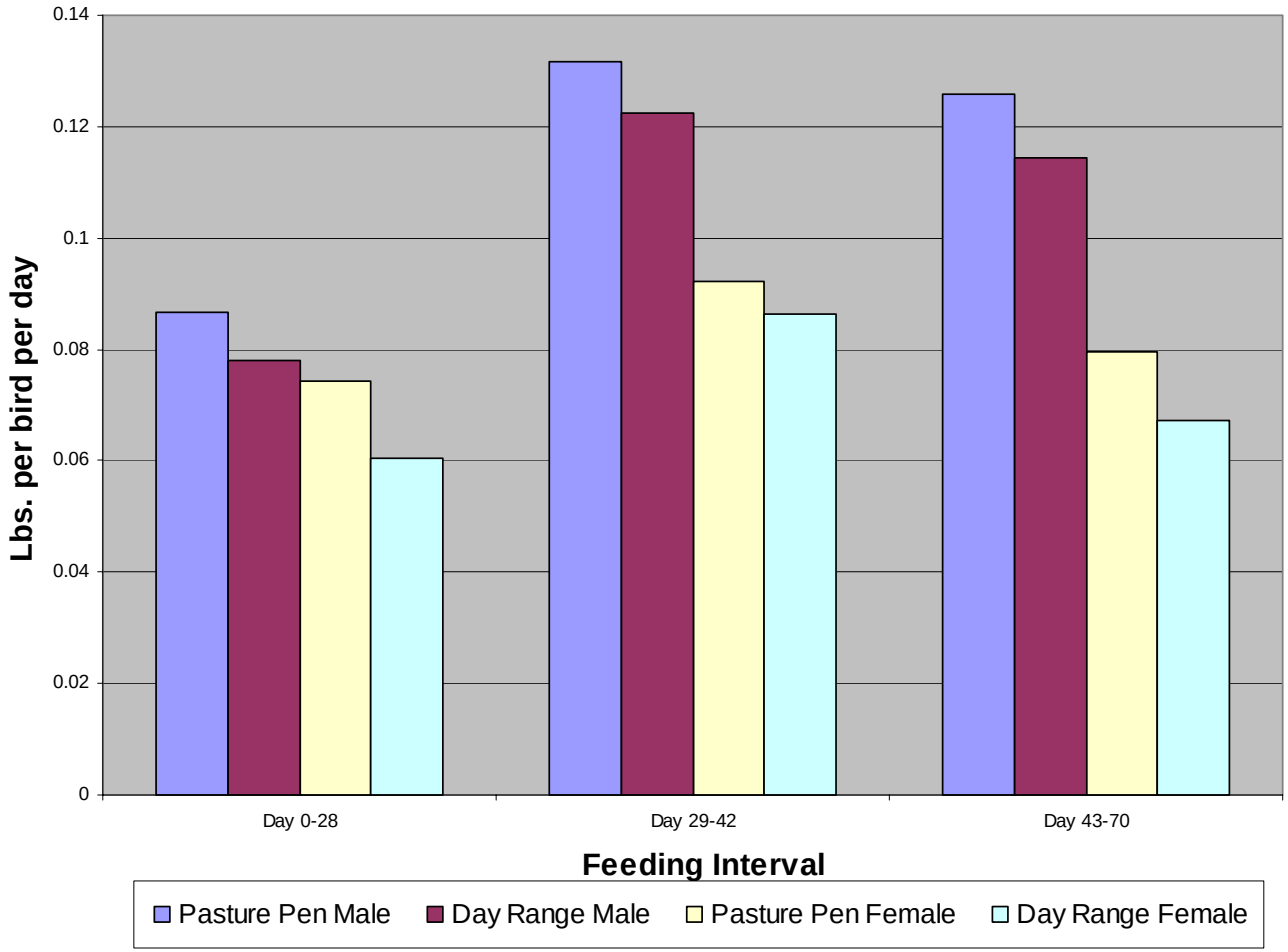
Average Daily Gain of Pasture Pen versus Day Range Male Rainbow Broilers

	Interval I 9/3-9/30	Interval II 10/1-10/14	Interval III 10/15-11/11	Total
Pasture Pen ADG	.086	.132	.126	.1128
n=	18	24	24	18
Day Range ADG	.078	.122	.114	.1040
n=	13	22	21	13
t-statistic *Equal variances not assumed	2.85	1.87	2.17	2.01
Significance *Equal variances not assumed	p<.008	p<.068	p<.035	p<.056

Average Daily Gain of Female Rainbow Broilers

	Interval I 9/3-9/30	Interval II 10/1-10/14	Interval III 10/15-11/11	Total
Pasture pen ADG	.075	.092	.079	.084
n=	7	17	17	7
Day Range ADG	.060	.086	.067	.069
n=	6	17	17	6
t- statistic *Equal variances not assumed	.465	1.59	2.84	3.35
Significance *Equal variances not assumed	p<.001	p<.121	p< .008	p<.007

Results: Mean Average Daily Gain (ADG) by Sex, by Production System



*Note: t-test showed significant difference in ADG ($p<0.05$) between pasture pen & Day Range Males and between Salatin and Day Range Females for 1st & 3rd intervals only

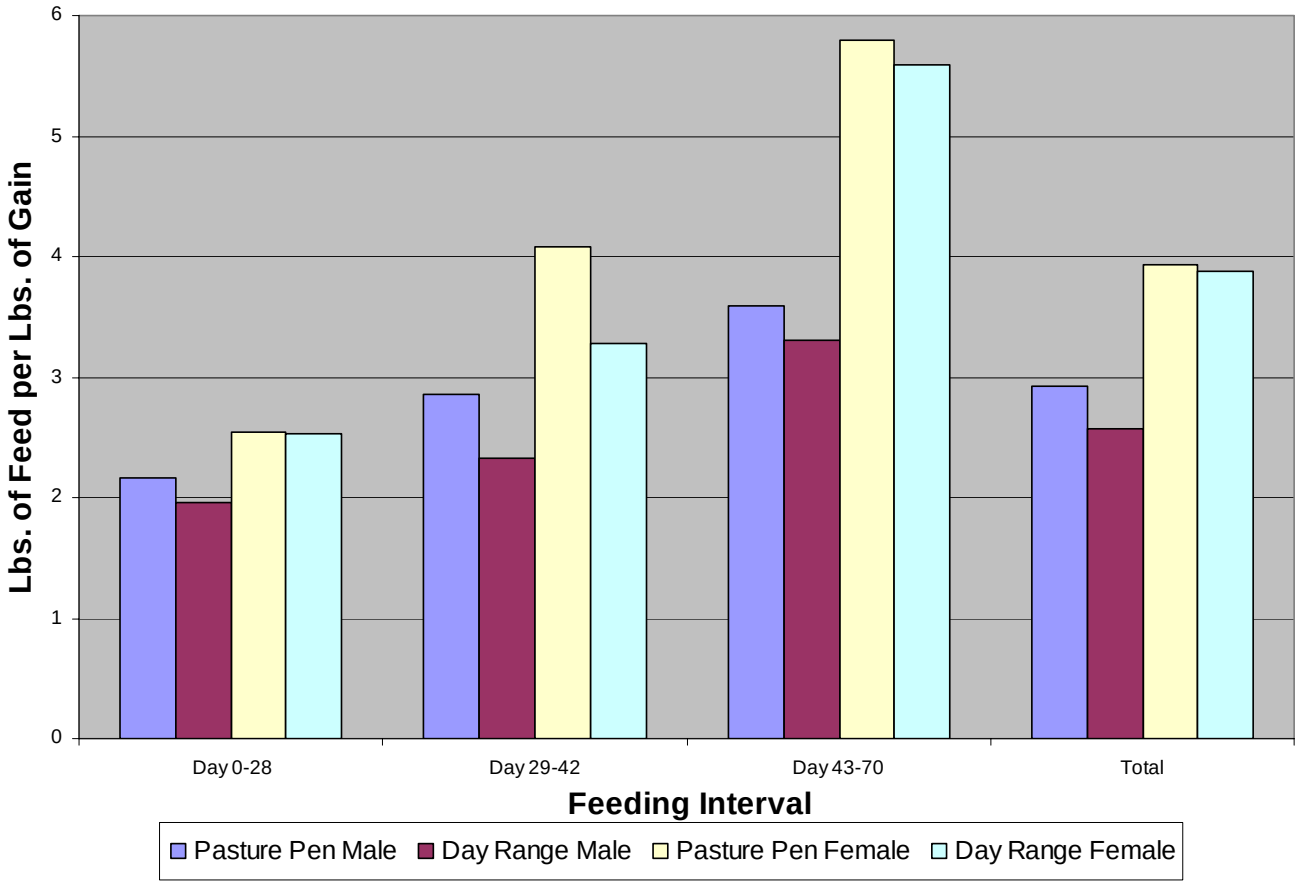
Feed Efficiency of Male Rainbow Broilers

	Interval I 9/3-9/30	Interval II 10/1-10/14	Interval III 10/15-11/11	Total
Pasture Pen FE	2.17	2.86	3.59	2.91
n=	18	24	24	18
Day Range FE	1.96	2.32	3.30	2.57
n=	13	22	21	13
t-statistic *Equal variances not assumed	2.74	5.15	1.76	3.07
Significance *Equal variances not assumed	p<.011	p<.000	p<.085	p<.005

Feed Efficiency of Female Rainbow Broilers

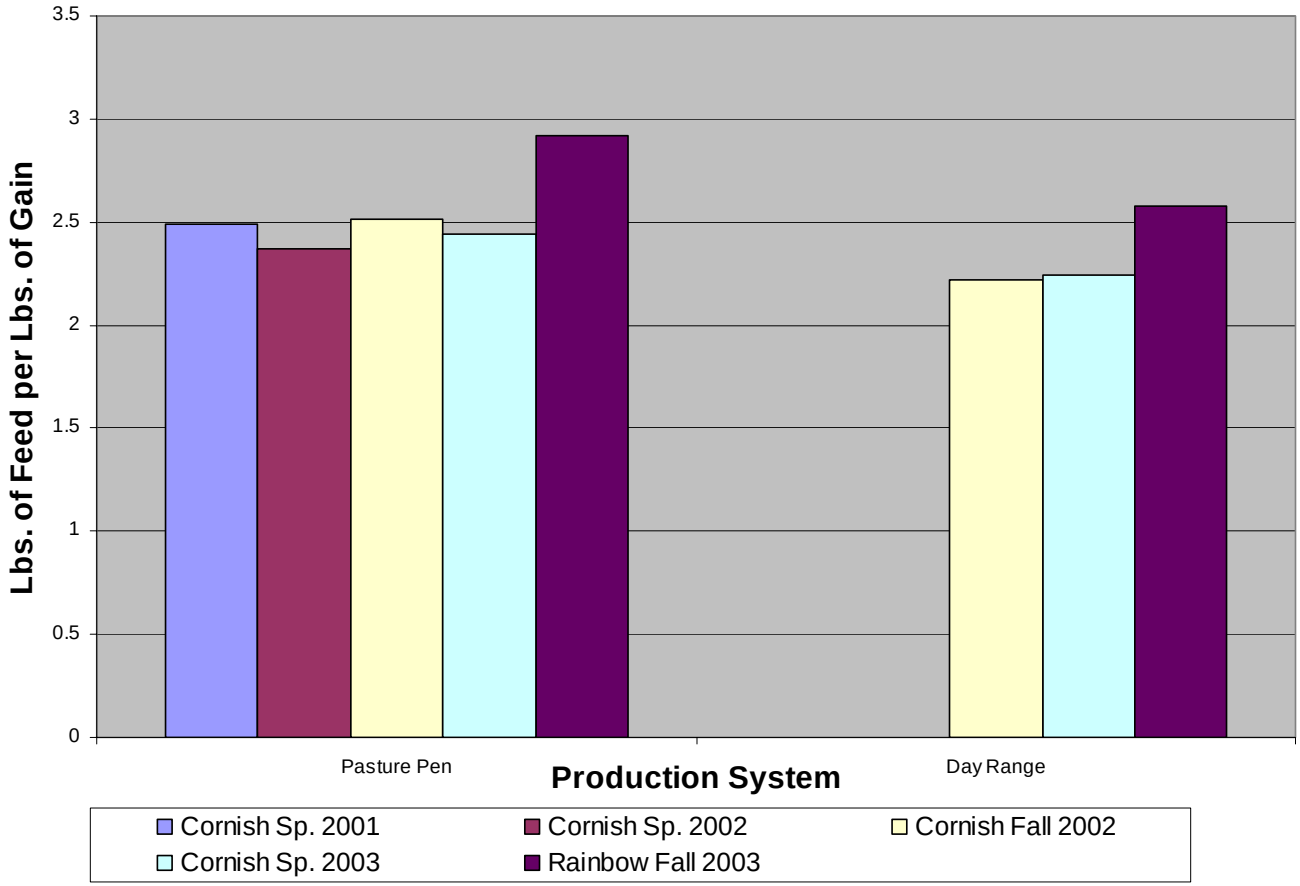
	Interval I 9/3-9/30	Interval II 10/1-10/14	Interval III 10/15-11/11	Total
Pasture Pen FE	2.54	4.07	5.79	3.92
n=	7	17	17	7
Day Range FE	2.52	3.27	5.58	3.87
n=	6	17	17	6
t- statistic *Equal variances not assumed	.116	4.87	.584	.229
Significance *Equal variances not assumed	p<.910	p<.000	p<.564	p<.823

Results: Mean Feed Conversion by Sex, by Production System



*Note: t-test showed significant difference in Feed Conversion ($p<0.05$) between Pasture Pen and Day Range Males for 1st and 3rd intervals and the overall trial, and between Pasture Pen and Day Range Females for the 2nd interval only.

Results: Comparison of Mean Feed Efficiency by Trial, by Group for Male Cornish-Rock and Rainbow Broilers



Conclusion/Discussion

- Rainbow Broilers in Pasture Pens gained more weight (higher ADG), but the Day Range gained more efficiently
- While a test of statistical significance was not done, nominally the Rainbow Broilers gained weight more slowly and less efficiently than Cornish Rock cross in past trials
- Rainbow Broilers did appear to be more active
- Further research is needed to determine appropriate feeding trial periods to achieve ideal market weights for Rainbow broilers.

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Abstract

- While past research has shown that Cornish-Rock broiler chickens raised on pasture can achieve slightly superior feed efficiency, this commercial breed is not ideal for pastured production (Chisholm, et al. 2003). In the current research, male and female Rainbow broilers (an alternative breed promoted for pastured production) were divided evenly among day-range and floorless pen systems. Each group was fed, *ad libitum*, an 18 percent protein ration of cracked corn and poultry crumbles in addition to free-choice orchard grass-alfalfa forage. Individual weights were taken on days 1, 21, 42, and 63. Similar to trials with Cornish-Rock broilers, Rainbow broilers in day range pens gained more efficiently (2.58 lbs feed-to-gain) than pasture pens (2.92 lbs feed-to-gain), while those in pasture pens gained more total weight. Contrary to our hypothesis, Rainbow broilers gained less efficiently than Cornish-Rock in past trials. Further research is needed to determine appropriate feeding periods to achieve ideal market weights for Rainbow broilers.