



# Center for Environmental Farming Systems

Report: Pasture Poultry at CEFS Prepared by: J.P. Mueller and Brad Smith

North Carolina State University

## *Farming Systems Research Unit*



			<b>CENTER FOR ENVIRONMENTAL FARMING SYSTEMS</b>
North Carolina Department of Agriculture and Consumer Services	NC A & T State University School of Agriculture	NC State University College of Agriculture and Life Sciences	

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# Pasture Poultry on The Farming Systems Research Unit –2002

## *Crop/Animal Integration*

### Objectives

- To explore the feasibility of adding a pasture poultry operation to the integrated crop/animal system on the CEFS Farming Systems Research Unit.
- To collaborate with American Livestock Breeds Conservancy and Virginia Tech. State University as one of several locations examining the immunology of standard versus commercial strains of turkeys under pasture conditions.

### Methods

#### Arrival & Brooding Stage

On May 30, 2002, 70 Bourbon Reds and 25 BUTA Commercial White turkey chicks arrived on the CEFS unit. The chicks were kept in two separate brooders, one for the reds and one for the whites. The brooders were an elevated wooden frame box with hardware screen and chicken wire on all sides and plywood flooring. Heating lamps were placed on the wire mesh top (3 per brooder) and the brooders were kept under a shed. Simple gravity fed water bottles and feeders were placed in each brooder, three per brooder (see Fig 1). For feed, the birds were started with Purina Game Bird ‘Startena’ and before the birds were switched to the next feed the reds consumed 215 kg (474 lbs) while the whites consumed 367 kg (808 lbs) of starter. The table below shows the nutritional value of the starter feed.

**BUTA Whites in the early brooding stage (1 week old)**



**Bourbon Red poult**



On June 3<sup>rd</sup>, the birds were weighed, averaging 75.6 g (2.43 oz) for the reds and 134.1 g (4.31 oz) for the whites. Shortly after on June 7<sup>th</sup>, 15 more BUTA whites were picked up from Gerry Cohn's farm (another participator in the project) and added to our existing flock, the whites then averaged 194 g (6.86 oz). On June 11<sup>th</sup>, the reds averaged 153.3 g (4.93 oz) while the whites were 321.3 g (10.33 oz). During their time in the brooders, a total of 13 bourbon reds died while the whites had no loss. Most of the deaths were for unknown reasons, but there were a few who died during a short electrical failure and the heat lamps were out, one died during shipping and one to a handling accident. It is noteworthy that the Reds were shipped from New Mexico while the whites were delivered directly from the hatchery by pickup truck.

### Starter Guaranteed Analysis

Crude Protein	30.00%
Lysine min	1.50%
Methionine	0.50%
Crude Fat min	2.50%
Crude Fiber	6.50%
Calcium min	1.00%
Calcium max	1.50%
Phosphorus	0.80%
Salt (NaCl)	0.25%
Salt (NaCl)	0.75%

### Turkey Tractor Stage

On June 13<sup>th</sup> the turkeys were moved in to their new homes, the turkey tractors. These tractors had never been used before but were built specifically for these birds. The shelter was framed with 2 by 4s, had chicken wire on all four sides and a metal shed roof. The flooring was a metal grate with openings for waste to drop through. The inside back half of the shelter had several 2x4's roughly 0.91 m (3') from the floor for the birds to roost on. The shelter also had a swinging door on the side for human entry and a long, low swinging door ('turkey door') at the bottom of the tractor (see next page for details on the tractor plans).

**Whites in the tractor for the first time (note the roosts)**



**Reds in the tractor for the first time**



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At this stage, all the bourbon reds were in one tractor and the whites in another. The reason for this early transition was to get the birds used to their new and more ‘permanent’ home while they were still young. While in the tractors the birds no longer needed their heat lamps. Almost two weeks later (June 25<sup>th</sup>) the birds were weighed and had their wings clipped and tagged with wing-band ID’s.

**Tagging, weighing and wing clipping**



**Preliminary Pasture Stage**

Two days later the tractors were moved to a ‘preliminary pasture’ to provide them with a small area to free range in. About three weeks later, the wooden frame fencing with chicken wire would be replaced by an electro net fencing.

**The birds initial trial grazing area before going out to pasture**



While in this stage, the birds were still on the starter feed but were also occasionally given organic vegetables to supplement their diet. They were also conditioned to the electric fence, allowing the chance for each bird to receive a shock and learn their boundaries.

Whites supplementing their diet with organic veges.



Reds feeding on some organic vegetables

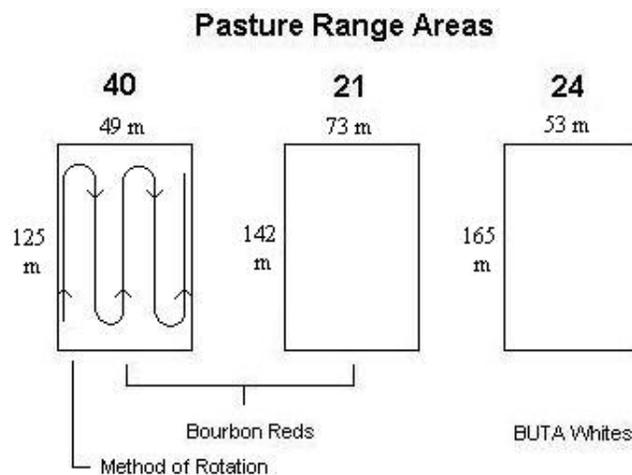


The turkeys remained here until about mid august, when on Aug 9<sup>th</sup> the birds were retagged, wings clipped, and separated into three different groups. There were two groups of bourbon reds (26 in each group) and one group of whites (40 birds), each group in its own turkey tractor.

### Pasture Stage

On the 12<sup>th</sup> of August the turkeys were weighed and the three tractors were assigned to three different pastures on the CEFS farming research unit, pastures 21, 24, and 40. The birds were ready to be set up on pasture. The diagram on the below shows the breakdown for how the birds were divided up and the size of the pastures which the birds would be grazing in. The pastures consisted of a mixture of warm season grasses including the following:

- Switchgrass: *Panicum virgatum*
- L.Big Bluestem: *Andropogon gerardii* Vitman
- Eastern Gamagrass: *Tripsacum dactyloides* (L.)
- Indian grass: *Sorghastrum nutans* (L.) Nash



The pastures had 75 to 95% canopy cover with herbage mass ranging from 700 (after grazing) to 3500 kg ha<sup>-1</sup> (before grazing). These pastures were also stocked with dairy steers. Now, the actual grazing area allocated to the birds at any given time was an area roughly 232 m<sup>2</sup> (2500 ft<sup>2</sup>) enclosed by 45.7 m (150')



electric fencing. . The fencing extended from the rear of the turkey tractor allowing for the birds to come and go from the tractor to pasture as they pleased, but not outside the fenced area. This tractor/fence combination was moved three times a week (Monday, Wednesday and Friday) and rotated around the pastures in the manner shown in the previous diagram. The 1.2 m (4') electroneet fencing was electrified by solar powered chargers (see below).

### Whites and Reds on their respective pastures



While on pasture the electric fencing system also provided the main protection against predators, along with the tractor. This obviously doesn't provide protection from raptor predation but fortunately raptors were not a problem, probably due to how large the birds were when they actually put out on pasture.

### Electroneet solar-powered energizer



## Feed

The turkeys were fed every day early in the morning (~8-9 a.m.) and used the feeder shown below. Each tractor had its own feeder that remained within the tractor. On Aug 21<sup>st</sup> all the birds feed was switched to the Developer feed. The nutrition information for this is shown below.

**Turkey feeder in the tractor**



**Developer Guaranteed Analysis**

Crude Protein min	24.00%
Lysine min	1.15%
Methionine min	0.47%
Crude Fat min	4.00%
Crude Fiber max	5.00%
Calcium min	0.90%
Calcium max	1.40%
Phosphorus	0.75%
Salt (NaCl) min	0.20%
Salt (NaCl) max	0.70%

## Water

Each tractor was hooked up to a pressurized water system that allowed for the turkeys water tub to automatically refill as needed. The pressurized hookups were located throughout the pasture, allowing for movement of the tractor to different locations while maintaining the water system (see the figures below).

**Pressurized water connection**



**Water line to the tractor**



**Auto watering device**



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### Weighing Method

The method used to weigh the birds changed as they grew. As chicks a simple flat scale worked but when the birds grew larger we had to change our methods.

#### Initial method of weighing the birds



#### As the birds grew weighing methods changed



### Maintenance and Keep

While on pasture, the turkeys were confined to a grazing area delineated by a 45.7m (150') perimeter of electric netting fence, an area of about 232.3 m<sup>2</sup> (2500 ft<sup>2</sup>). The birds were let out of the tractor early in the morning, every morning, and were shut up in the tractor at night to help prevent predation. Later, however, as the birds got bigger the door was no longer shut at night. As far as maintenance goes for the birds during this period, the birds were fed every morning and checked daily for any changes, behavior, deaths, etc. They were weighed and wings clipped about every two weeks. The tractors were moved three times a week (Monday, Wednesday and Friday) in a zigzag pattern over the entire area of the pasture to ensure consistent supply of fresh pasture and good distribution of manure.

After almost two months on pasture and at an age of 18 weeks, 35 of the 40 BUTA white turkeys were slaughtered on Oct 1<sup>st</sup>. Only five of the whites died during their time at CEFS, over half of those were due to *staph* infections (see mortality summary report in Results). The bourbon reds at this point were still less than what seemed to be a reasonable target weight (9 lb hens and 14-15 lb toms) so when they were 20 weeks old, on Oct 25<sup>th</sup> they were put on their finishing feed, *Market Bird Finisher*.

During the week of the 25<sup>th</sup> it was noted that the toms were acting aggressively toward the hens, possibly trying to mate, and we kept finding large groups of hens outside of the fence. So, to prevent them from mating and to try to keep the birds a little calmer, we decided to segregate toms and hens. This left us with two groups of birds; the hens on pasture 40 and the toms on pasture 21. This posed no problems for the hens, it turned out for the worse for the toms. When mixed they were extremely aggressive towards one another to the point where they would not calm down. We mixed them on the 1<sup>st</sup> of November (Friday) and when we returned on Monday there were ten toms missing. Later that day their bodies were found throughout the surrounding fields and ditches and it was obviously due to predation, most likely coyotes.

### Finisher Guaranteed Analysis

Crude Protein min	18.00%
Lysine min	0.97%
Methionine min	0.40%
Crude Fat min	4.00%
Crude Fiber max	4.00%
Calcium min	0.85%
Calcium max	1.35%
Phosphorus	0.59%
Salt (NaCl) min	0.25%
Salt (NaCl) max	0.75%

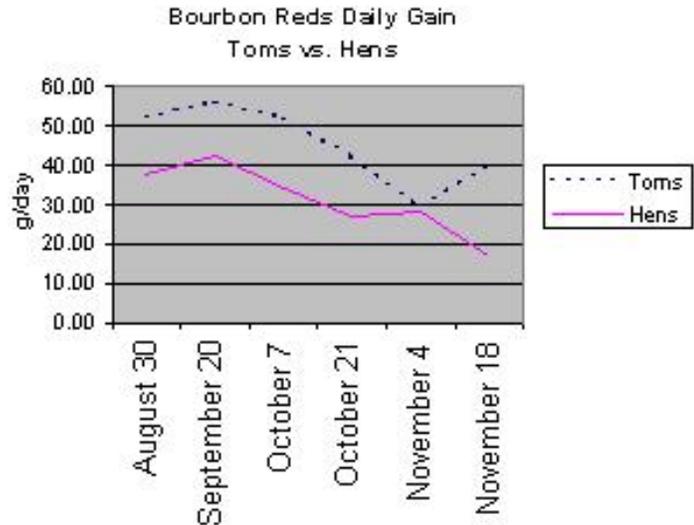
Since the bourbon reds rate of gain was slowing significantly and the fact that we suffered a fairly large loss with the predation, the reds were slaughtered on Nov. 20<sup>th</sup>. So, after over three months of being on pasture, 35 of the 70 bourbon red turkeys made it to slaughter. At this point the birds were 24 ½ weeks old. The processing for all the birds was done at a local personal operation owned by Andy Youngblood. It's also worth noting that there were no supplements or prophylactic medications used on these birds at any time.

### Transportation and processing of the birds

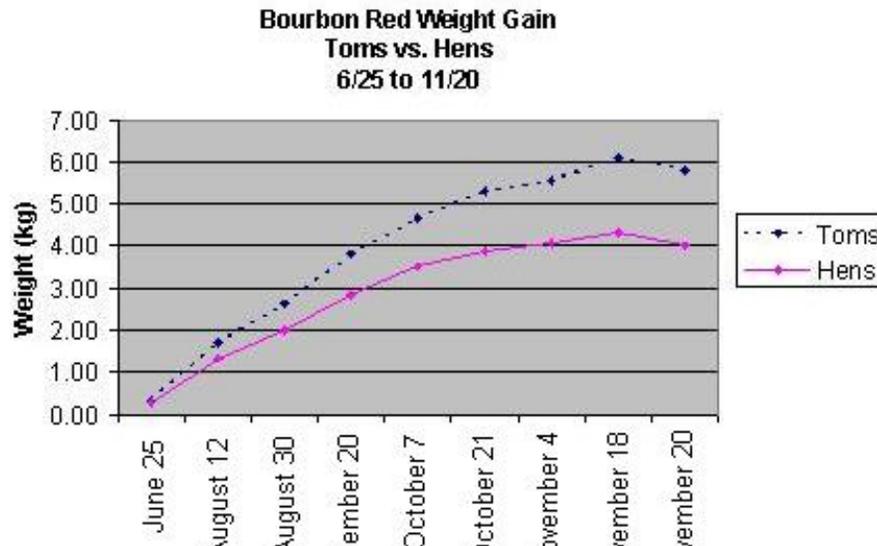


## Results

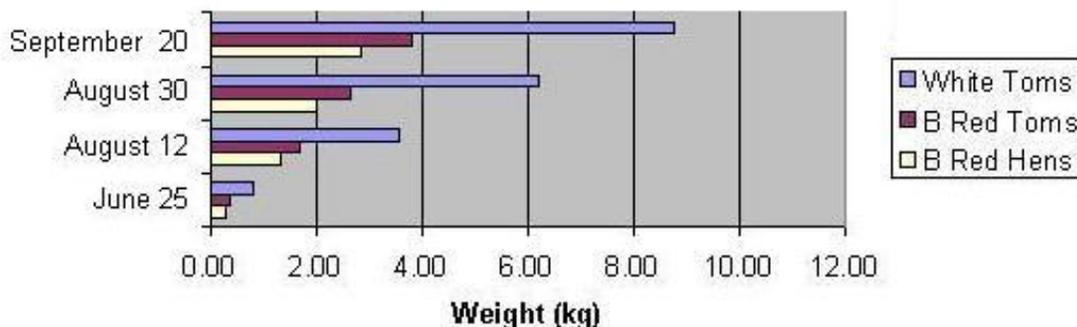
At 18 weeks the BUTA whites averaged 9.45 kg (20.8 lbs) on the day of the slaughter (Oct 1<sup>st</sup>) and had an average carcass weight of 7.28 kg (16 lbs), dressing out at an average of about 77%. The diagram below shows the progression in weight gain for the whites. The bourbon reds turned out to have a much smaller final weight than the whites. You can see by the figure on the right that the birds rate of gain was decreasing fairly significantly. In light of this and the fact that the thanksgiving & Christmas market would be missed if we waited to long, we decided to slaughter the reds on Nov 20<sup>th</sup>.

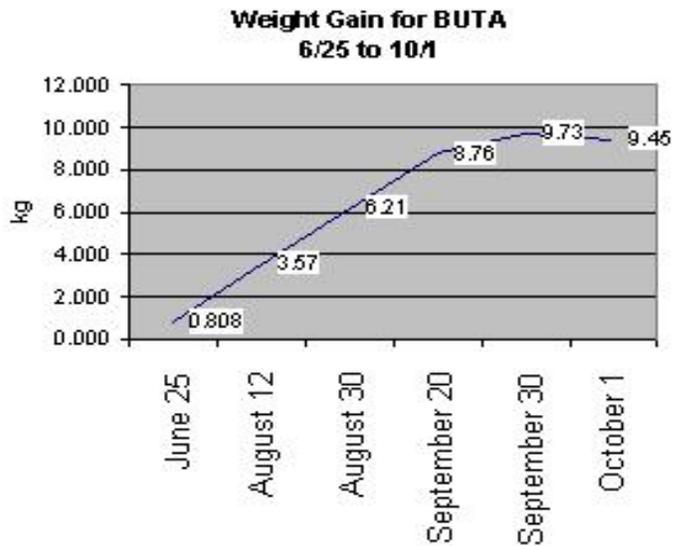


The red toms averaged 5.81 kg (12.8 lbs) just before being killed with a carcass weight of 4.17 kg (9.17 lbs), dressing out at an average of about 72%. The hens averaged 4.00 kg (8.8 lbs) before being killed with a carcass weight of 2.86 kg (6.29 lbs), dressing out at an average of 71%.



**Weight Gain Comparison of BR Toms, BR Hens and  
WhiteToms  
6/25 to 9/20**





Only 35 of the 70 bourbon reds and 35 of the 40 whites resulted in a salable product. There are only 34 recorded deaths of the bourbon reds so one must have died or got out sometime before the tagging stage and somehow went unnoticed or possibly unreported.

Nevertheless, it should be noted that 12 of the 14 deaths recorded above (\*) are most likely attributed to cold stress from a power outage that occurred over one weekend while the birds were still in brooders under the heat lamps. If deaths from this error and coyote predation are removed (management error) the resulting death of about 17% is reasonable.

#### Mortality Data Summary

NUMBERS	REDS	MORTALITY	WHITES	MORTALITY
Initial	70		40	
Slaughtered	35		35	
		%		%
<b>Type of Loss</b>				
Unknown	14	2	-	-
Disease	-	-	3	7.5
Predation	11	15.7	2	5.0
Unrecorded	1	1.4	-	-
Miscellaneous	9	12.9	0	-
<b>Total</b>	<b>35</b>	<b>50</b>	<b>5</b>	<b>12.5</b>

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The following two tables give a summary of the feed efficiency, kg for kg, for the whites and reds. The whites required on average 3.85 kg of feed to gain one kg and the reds required on average 5.8 kg of feed to gain one kg.

Feed Efficiency for BUTA WHITES		
	kg feed per	kg gain per
Growth Intervals	kg gain	kg feed
8/12/02 to 8/29/02	2.54	0.39
8/30/02 to 9/19/02	4.31	0.23
9/20/02 to 9/30/02	4.72	0.21
<b>Average:</b>	<b>3.85</b>	<b>0.28</b>

Feed Efficiency for RED BOURBONS		
	kg feed per	kg gain per
Growth Intervals	kg gain	kg feed
8/12/02 to 8/29/02	2.66	0.38
8/30/02 to 9/19/02	4.80	0.21
9/20/02 to 10/6/02	3.84	0.26
10/7/02 to 10/20/02	7.06	0.14
10/21/02 to 11/3/02	8.77	0.11
11/4/02 to 11/20/02	7.65	0.13
<b>Average:</b>	<b>5.80</b>	<b>0.21</b>

On November 8 the whites were brought on N.C. State campus where several members of the local CSA met to buy produce as well as the turkeys. All but seven birds were sold for \$2/lb giving a total sales of **\$869.26**. The CSA and local word of mouth were pretty much the only sources for the birds' advertisement. The bourbon reds were also sold through the CSA on Friday Dec 13 at the on-campus brickyard sale and at the NC Solar Center Thursday Dec 12. All but nine birds were sold for \$2/lb for birds



## Annex 1. Plans for the “Turkey Tractor”

### Turkey Tractor Plans

Designed & built by Marty Dudley and Jason Talton (CEFS staff)

#### Materials

2”x2”x ¼ “ Angle

2”x2”x ¼ “ Square Tubing

2”x4” Treated Boards

1”x6” Treated boards

Metal or Poly Chicken Wire

5 V Tin / ½ “ Insulation

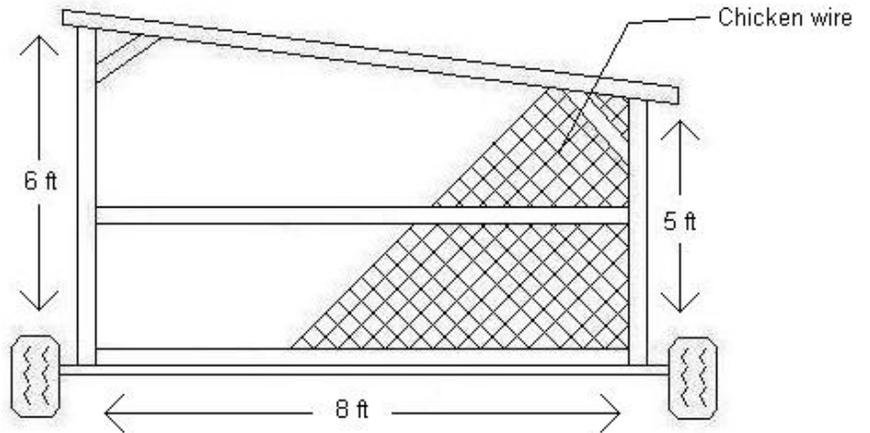
Spindles / Wheels / Rims

Expanding Metal (4’x8’ sheets)

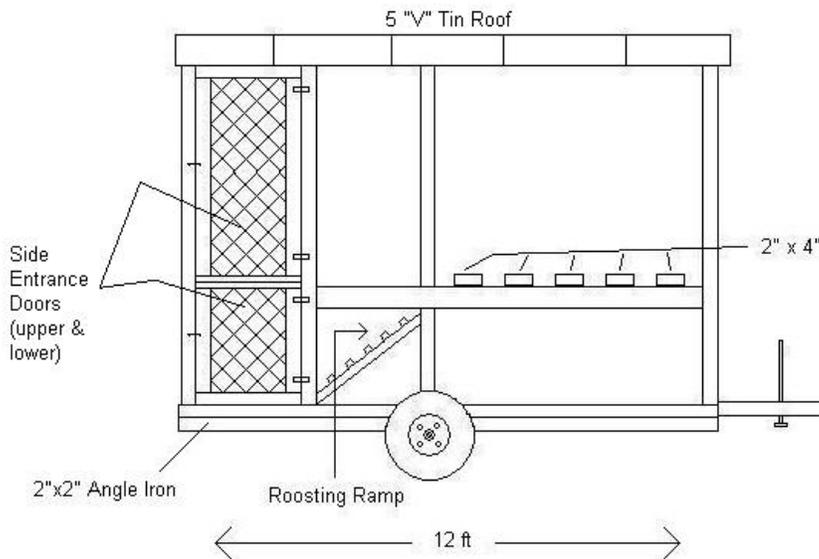
¾ Plywood (optional)

Hinges & Hasps

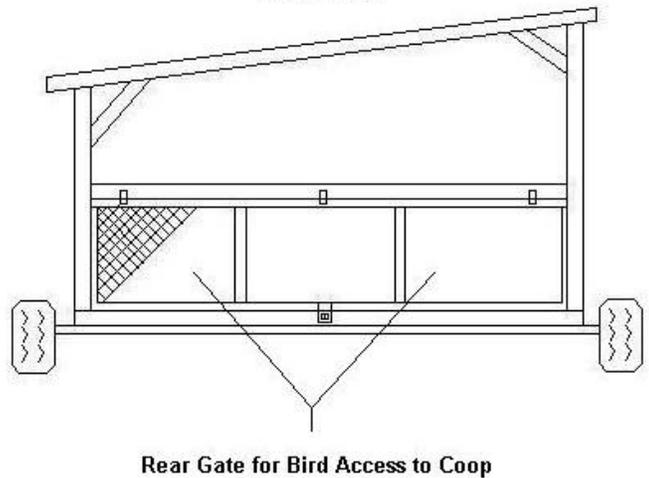
**Front View**



**Side View**



**Rear View**



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## Annex 2. Mortality Data

Date	ID	Pasture	Breed	Cause of Death
05/30/02	unknown	prior to	1 red	dead on arrival, possibly stress from trip
05/31/02	unknown	prior to	6 red	electrical failure, heat lamps out
06/01/02	unknown	prior to	1 red	handling accident
06/02/02	unknown	prior to	1 red	unknown
06/03/02	unknown	prior to	4 red	unknown
06/17/02	unknown	prior to	2 red	unknown
06/18/02	unknown	prior to	1 red	unknown
08/01/02	unknown	prior to	1 red	caught in electro net & shocked to death
08/20/02	484	24	white	unknown
08/23/02	15	24	white	necropsy showed staph infection
08/25/02	407	21	bourbon red	necropsy showed no significant diagnosis
08/27/02	475	24	white	unsure, thought to be heat stress
09/03/02	19	24	white	necropsy showed staph infection
09/15/02	404	40	bourbon red	unsure, had one leg swollen
09/20/02	389	21	bourbon red	unknown
09/22/02	3	21	bourbon red	unsure, noticed a weight loss & died shortly after
09/23/02	487	24	white	necropsy showed staph infection
10/17/02	409	40	bourbon red	unknown
11/01/02	388	21	bourbon red	predation, most likely fox or coyote
11/04/02	401	21	bourbon red	Coyote predation - birds had been very aggressive when all toms were mixed together and some were driven (flew) outside the fence. Once outside they were killed (includes birds 401-442 in column 1)
	405	21	bourbon red	
	410	21	bourbon red	
	414	21	bourbon red	
	419	21	bourbon red	
	420	21	bourbon red	
	428	21	bourbon red	
431	21	bourbon red		
441	21	bourbon red		
442	21	bourbon red		
11/12/02	417	21	bourbon red	unknown, bird is missing, no body found

## Annex 3. Project Timeline

<b>Turkey Development Timeline</b>		<b># Red</b>	<b># White</b>
30-May	70 Bourbon Reds & 25 BUTA Whites arrived at CEFS unit	69	25
3-Jun	<b>Weighing 1</b> Reds 2.43 oz each (3 lbs 5.4 oz for 22 poults) Whites 4.31 oz each (3 lbs 8 oz for 13 poults)	57	25
7-Jun	15 more Whites were picked up from Gerry Cohn's, 6.86 oz avg	57	40
11-Jun	<b>Weighing 2</b> Reds 4.93 oz each Whites 10.33 oz each	57	40
13-Jun	Chicks were moved from the brooders to the turkey tractors	57	40
25-Jun	<b>Identification tags were put on all turkeys</b> <b>Wing Clipping 1</b> <b>Weighing 3</b> Reds .319 kg Whites .808 kg	54	40
27-Jun	Tractors were moved to the old dairy to be put out on a 'trial' grazing area Electric fence testing was done here for the next couple weeks, letting the birds get used to the electronet.	54	40
9-Aug	New identification tags were put on all turkeys. These were larger and less likely to come off. Birds were also sorted in to their tractors. 52 bourbon reds divided in to two tractors and all the whites in a third tractor. <b>Wing Clipping 2</b>	53	40
12-Aug	The turkey tractors were set up out in their respective pastures. The bourbon reds were set up on pastures 21 and 40 while the whites were set up on pasture 24. <b>Weighing 4</b> Reds 1.56 kg Whites 3.57 kg	53	40
21-Aug	Food switched to Sporting Bird Developer	53	39
30-Aug	<b>Wing Clipping 3</b> <b>Weighing 5</b> Reds 2.39 kg Whites 6.21 kg	52	37
	<b>Weighing 6</b>	50	36

20-Sep	<ul style="list-style-type: none"> <li>•</li> <li>•</li> <li>•</li> <li>•</li> <li>•</li> <li>•</li> <li>•</li> </ul> Reds 3.44 kg Whites 8.76 kg		
30-Sep	<b>Weighing 7 for Whites = 9.73 kg</b>	49	35
1-Oct	Whites taken to be slaughtered <b>Final Weighing for Whites = 9.45 kg</b>	49	<b>35 went to slaughter</b>
7-Oct	<b>Weighing 7 for Reds = 4.23 kg</b>	49	
17-Oct	Whites picked up from slaughter house and placed in frozen storage Average Dressing percent was % <b>77</b> Giving average bird size of <b>7.28 kg</b> or <b>16 lbs</b>	48	
21-Oct	<b>Weighing 8 for Reds = 4.76 kg</b>	48	
25-Oct	Started all reds on Market Bird Finisher feed	48	
1-Nov	All hens from both pastures mixed together and put on pasture 40 All toms from both pastures mixed together and put on pasture 21	47	
4-Nov	<b>Wing Clipping</b> <b>Weighing 9 for Reds = 4.93 kg</b> Lost 10 birds to coyote predation	37	
8-Nov	Whites were taken on campus and sold to CSA members (7 remain unsold)	37	
18-Nov	<b>Weighing 10 for Reds = 5.33 kg</b>	36	
20-Nov	Reds taken to be slaughtered <b>Final Weighing for Reds = 5.03 kg</b>		<b>35 went to slaughter</b>
25-Nov	Reds picked up from slaughter house and place in frozen storage Average Dressing percent was % <b>71</b> Giving average bird size of 2.86 kg (6.3 lbs) for the hens and 4.17 kg (9.2 lbs) for the toms		(Only 31 slaughtered, 4 kept to breed)
12-Dec	Reds were taken to NC Solar Center and sold for \$2/lb		
13-Dec	Reds were taken to On-Campus Brickyard Sales and sold (9 remain unsold)		