Field Trial Summary: Cover Crop Comparison

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**Overview:**

This summer I had the opportunity to run field trials based on what the members of APPPA had questions about. By far the biggest question asked was “What cover crops work best for poultry?” So we gathered up all the cover crop suggestions, figured out which ones would grow (and keep for multiple weeks) here in south central Pennsylvania, and started at it. We chose four cover crops and tried to represent multiple geographies and heat zones in order to be as geographically diverse as possible. We ended up planting an alfalfa/orchard grass combo, turnips, kale, and buckwheat.

We started with 80 chicks in the brooder all being raised on an organic 20% broiler feed. At 3.5 weeks, the birds were moved to pasture and split into four equal groups. Each group was placed in a 4.5 x 8 ft. moveable field pen atop a specific cover crop that would act as their only source of pasture for the duration of the trial. The birds were given unlimited access to fresh feed, water, and grit and were moved daily onto a fresh section of cover crop. During July, which was largely when these birds were out on pasture, the temperature averaged 85 degrees F, with the lowest being 71 degrees and the highest being 93 degrees. Overall, the cover crops made it through even the hottest points of the summer; however the turnips in particular did start to show signs of leaf burn.

Out of the four groups, the kale group was the most successful both in terms of profit as well as overall personality of the birds. That group utilized more forage and less bagged feed in order to produce a high-yielding carcass weight and a greater profit margin. However, it should be noted that kale is an annual so it will need to be replanted every year, whereas the alfalfa/orchard grass is a perennial mix so farmers can input the labor on the first year but then get up to seven years of regrowth. This should be taken into consideration when deciding which cover crop was, in fact, more successful. Farmers can get a regrowth with kale in the same growing season after the chickens have gone through it, but they will still have the additional labor costs on an annual basis.

Table 1 shows the average per-bird production numbers for the trial from the brooder to processing. The cost of production includes the cost of the 20% broiler feed ($27.53 / 50# bag), the current cost of water per gallon in Bainbridge, PA ($0.011 / gallon), an assumption of 40 minutes/day in the brooder and 15 minutes/pen/day at a rate of $12.00 per hour of labor (a time log was kept throughout), and an average sale price of $4.00/lb. carcass weight. The carcass weights were calculated with the necks still attached and without giblets. For labor, it was determined to cost $2.40/bird in the brooder and $4.20/bird in the field with a field prep cost of $10.00/row. The cost of the cover crop seed was determined to be insubstantial to the overall cost analysis (the maximum cost was 5 cents/bird for this scale).

The Feed Conversion Ratio (FCR) is the amount of feed consumed to gain one pound of body weight. It is more important to look at the FCR for carcass weights than it is live weights because the carcass weights are how a majority of producers sell poultry.

The biomass was calculated based on samples pulled from each pen before and after the birds had access to the forage, then averaged to represent the entire allotment of the field that the birds had access to. This was then divided by the number of birds in each pen to show an estimated per bird consumption of each forage. The birds were 52 days old when processed (24 days in the brooder, 28 days in the field).

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| **Table 1: Per Bird Production Values by Cover Crop** | | | | |
|  | **Alfalfa/Orchard Grass** | **Turnips** | **Kale** | **Buckwheat** |
| **Yields** | | | | |
| Live Weight | 5.50 lb. | 5.60 lb. | 5.38 lb. | 5.32 lb. |
| Carcass Weight | 4.25 lb. | 3.88 lb. | 4.20 lb. | 4.00 lb. |
| Carcass Yield | 77% | 69% | 78% | 75% |
| FCR (Live) | 1.69 lb. | 1.54 lb. | 1.61 lb. | 1.67 lb. |
| FCR (Carcass) | 2.19 lb. | 2.29 lb. | 2.06 lb. | 2.22 lb. |
| **Profit** | | | | |
| Sale Price ($4.00/lb.) | $17.00 | $15.52 | $16.80 | $16.00 |
| Cost of Production | $12.46/bird | $12.09/bird | $12.11/bird | $12.20/bird |
| Profit | $4.54/bird | $3.43/bird | $4.69/bird | $3.80/bird |
| **Feed, Water, and Forage Consumption** | | | | |
| Water | 9 gallons | 10 gallons | 11 gallons | 9 gallons |
| Feed | 9.33 lb. | 8.65 lb. | 8.67 lb. | 8.89 lb. |
| Estimated Forage Consumption | 0.20 lb. | 1.14 lb. | 1.57 lb. | 1.80 lb. |
| Biomass  Before | 18.76 lb. | 24.64 lb. | 38.64 lb. | 37.52 lb |
| Biomass After | 14.84 lb. | 2.84 lb. | 8.68 lb. | 3.08 lb. |

**Biomass**

In terms of biomass, the cover crops varied significantly as to what was left. The alfalfa grass was left largely intact minus the top leaves being clipped, however there were patches where the grass had been completely removed. Opposite this, the turnip plot did not hold up well to the chickens and the sun damage and a large majority of it was removed. The kale still had significant amounts of forage left, though it was obvious the birds thoroughly went through and clipped most of the bigger leaves. The buckwheat flowers and leaves were all eaten, so only the stems remained and those were matted down on the ground. The forage consumption numbers listed in Table 1 are estimations based on what was observed. There is no way to quantify if these numbers are accurate, so these numbers are considered educated guesses based on the numbers that were recorded before and after the chickens had access to the paddocks. There is validity to them from a producer’s point of view because they may be used to estimate impacts to the soil and overall additions to a pasture’s biomass. The biomass and the amount of forage consumed are correlated; however there is no connect between the two and carcass yield as might have been expected.

**Soil Impact**

The impact to the soil also varies with each cover crop. I asked one of our agronomists here at Fertrell, Dan Dalton, about the impact of the cover crops to the soil after the chickens had been run through them, and here’s what he had to say: “The alfalfa/orchard grass will have added nitrogen and carbon to the soil, as well as supported microorganisms through root die-off after grazing with chickens. It will have also held onto, and likely helped to breakdown, the manure deposited by the chickens. Additionally, it will have prevented erosion and helped to suppress weeds.”

“The turnips will add carbon to the soil as well as gathering/retaining/releasing nitrogen, phosphorus, and potassium in the soil as they decompose. They will improve the soil tilth by aerating the soil with their tap roots and will help to suppress pathogenic nematodes and weeds when they were alive.”

“The kale will have added carbon to the soil and supported microorganisms through root die-off after grazing. The stems will be a nice source of biomass/organic matter and will help to bind some of the nutrients from the deposited manure. Kale is also good at suppressing soil pathogens and will have prevented some weeds from developing, especially since there was a good canopy of leaves.”

“Finally, the buckwheat will have added carbon to the soil and supported microorganisms through root die-off after grazing. The stems will be a nice source of biomass/organic matter and will help to bind some of the nutrients from the deposited manure. Buckwheat is very good at solubilizing phosphorus and there will be some residual phosphorus that is left in the roots and stems that will be available to soil microbes and future crops. In addition, it also scavenges potassium from the soil, making it available to future crops. Buckwheat is excellent for suppressing mid-summer weeds through canopy cover and preventing weed seeds from germinating. It is also an excellent source of nectar for pollinators.”

**Applying Scale to the Trial**

In order to apply this study to a larger farm scale, you must consider the total area and how labor, etc. would differ if you were looking at this based on an entire acre instead of just a small plot for one field trial. To this point, the alfalfa/orchard grass combination appears to equal itself with the kale group. Considering labor, acreage, and fertilizer inputs the alfalfa/orchard grass combo would need the labor in year one, however after this the field would require significantly less time and input to regrow annually. The kale group requires more inputs upfront and would require replanting every year. Both groups regrow after the chickens are run through them, however the kale would only be expected to regrow once or twice during a season whereas the alfalfa/orchard grass would be able to regrow up to six times per season. Applying this to raising chickens, in theory, you could run 2-3 groups of chickens on the same plot of kale throughout one season; however you could run up to 6 batches of chickens on the alfalfa/orchard grass combination. It may be that if you are utilizing a small amount of acreage for a larger amount of birds, the alfalfa/orchard grass combo works better.

In addition to the crops themselves, the cost of raising birds with the alfalfa/orchard grass combination was only slightly higher than raising the kale birds. While they did take more grain feed, the carcass weights were very similar in the end and therefore the profits were very close. This indicates that on a larger scale, your profits would most likely be similar using either cover crop once labor was taken into consideration.

**General Observations:**

Of note was the personality of the birds in the various pens. The birds in the alfalfa/orchard grass group had less protection from the sun and were noticeably hotter than the other groups. They were also the muddiest group of chickens and the least likely to get excited about moving forward to new pasture. The turnip group loved the bugs that came with the turnips, however it is undetermined if they really were excited for the turnips themselves, particularly in the latter part of the trial when the turnips began getting leaf burn. The kale group was easily the most excited group to move forward on a daily basis, and they were also one of the more vocal groups when I approached the pen. Finally, the buckwheat group loved making ‘hidey-holes’ in the buckwheat stems as soon as the pen was moved to fresh crop. That was my least favorite pen to have to move because by mid-summer, the buckwheat was as tall as my waist. I eventually had to trample the outer edges of the buckwheat down in order to be able to pull the pen on top of it. The buckwheat birds were the cleanest of the chickens by far though, with the buckwheat acting almost as a slatted floor that allowed many of their droppings to hit the soil without getting on the birds.

**Follow-Up**

Future studies will aim to assess a different batch of cover crops, study the effects of trap crops in relation to chickens, or start to experiment with various cover crop blends. If readers have any questions on the process or the results of this trial, please feel free to email Casey@Fertrell.com or call the Fertrell office at 800-347-1566 ext. 224. For photos of the trial set-up, the birds in the various cover crops, and the processing day for this group, please visit the Fertrell Facebook page.