1. **Project Name and Contact Information**
   “A Study of More Cost Effective Ways of Crop Production”
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   Richfield, PA 17086
   717-694-3405
   kpontius@pa.net

2. **Goals**
   The goal of “A Study of More Cost Effective Ways of Crop Production” was to determine
   the feasibility of using non-traditional crops for grain farming in the Northeast United
   States.

3. **Farm Profile**
   For the past twelve years, I have been a full-time farmer. Over the years, I have
   experimented with crops to determine what is the best crop rotation for the type of soil
   where I farm. I currently own 70 tillable acres and rent an additional 530 acres to make
   my total farming operation 600 acres. The crops produced during the 2004-growing
   season were corn, soft red wheat, hard red wheat, buckwheat, sorghum, oats, alfalfa and
   barley. In addition to my cropland, I work in partnership with my father on a 40-cow
   dairy operation.

4. **Participants**
   Throughout this project, Greg Hostetter, Juniata County Extension Agent, has served as
   the primary consultant. Mr. Hostetter has assisted me in designing the research plots,
   keeping accurate records along the way and making proper use of the steps of the
   scientific method while harvesting the crops. In addition, Mr. Hostetter made
   arrangements for my field day and was present to help me field questions from local,
   interested farmers. In addition, Krista Pontius, FFA Advisor at Greenwood High School,
provided support by arranging for students to be available during harvest of the test plots. This proved valuable for both parties. I was able to acquire some much needed assistance harvesting and the students had the opportunity to work directly with a research project.

5. Project Activities

*Corn- Grain Sorghum*

Question: Is there an economic advantage of raising grain sorghum rather than corn?

Project Methods: Using a four acre plot, we will plant a 24 foot wide strip of grain sorghum and a 24 foot wide strip of corn, the test will be replicated four times.

*Oat-Clover*

Question: Does underseeding oats with clover produce an adequate amount of Nitrogen to successful grow crops?

Project Methods: Using a three acre plot of oats, we will underseed clover into a 30 foot strip and use another 30 foot strip as a control. This test will be replicated four times within the plot. (The original grant proposal was to overseed wheat with clover but this was not possible during the last growing season because of the amount of snow cover.) The second year, we planted corn in the plots to determine which would result the best yield.

*Buckwheat*

Question: Is buckwheat a feasible fruit to use in crop rotations in the Northeast?

Project Methods: Using the recommended application rate (50 lb./acre) we will create several plots of buckwheat, using two acre strips, focusing on planting date and tillage methods. The plots will consist of: a no-till plot planted on July 26, a minimum-till (chisel plow) plot planted on August 2, a no-till plot planted on July 30, a minimum-till plot planted on July 30, a no-till plot planted on August 9, and a minimum-till plot planted on August 9. We will also
plant one strip of full season buckwheat to use as a control. The dates could vary slightly depending on maturity of wheat and weather conditions.

**Barley-Grain Sorghum**

Question: Is it an economically sound practice to use grain sorghum as a double crop after barley?

Project Methods: After the barley is harvested, we will use the two three acre strips to plant grain sorghum. We will plant a strip of no-till. (Minimum-till was originally proposed, but it was unable to occur because of the excessive amounts of rain received during the summer months.)

6. **Results**

<table>
<thead>
<tr>
<th><strong>Corn-Grain Sorghum</strong></th>
<th>Crop</th>
<th>Date Harvested</th>
<th>Number of Rows</th>
<th>Length of Rows</th>
<th>Number of Plots</th>
<th>Plot Size</th>
<th>% Moisture</th>
<th>Yield (lbs)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Grain Sorghum</td>
<td>12/31/04</td>
<td>5</td>
<td>530 ft</td>
<td>4</td>
<td>.77 acre</td>
<td>13</td>
<td>719</td>
</tr>
<tr>
<td>Corn</td>
<td>11/15/04</td>
<td>4</td>
<td>531 ft</td>
<td>4</td>
<td>.62 acre</td>
<td>15.5</td>
<td>1934</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Oat-Clover</strong></th>
<th>Crop</th>
<th>Date Harvested</th>
<th>Number of Rows</th>
<th>Length of Rows</th>
<th>Number of Plots</th>
<th>% Moisture</th>
<th>Yield (bu/acre)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clover</td>
<td>12/31/04</td>
<td>32</td>
<td>530 ft</td>
<td>4</td>
<td>15.5</td>
<td>68.7</td>
<td></td>
</tr>
<tr>
<td>No Clover</td>
<td>12/31/04</td>
<td>32</td>
<td>530 ft</td>
<td>4</td>
<td>15.5</td>
<td>75.7</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Buckwheat</strong></th>
<th>Tillage Practice</th>
<th>July 26</th>
<th>August 2</th>
<th>August 9</th>
<th>Harvest Date</th>
<th>% Moisture</th>
</tr>
</thead>
<tbody>
<tr>
<td>Full Tillage</td>
<td>4.37 cwt/acre</td>
<td>4.72 cwt/acre</td>
<td>2.94 cwt/acre</td>
<td>10/30</td>
<td>15</td>
<td></td>
</tr>
</tbody>
</table>

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<table>
<thead>
<tr>
<th>No-till</th>
<th>0</th>
<th>0</th>
<th>0</th>
<th>N/A</th>
<th>N/A</th>
</tr>
</thead>
</table>

**Barley-Grain Sorghum**

<table>
<thead>
<tr>
<th>Barley-Sorghum</th>
<th>Harvest Date</th>
<th>Plot size (acre)</th>
<th>Yield (LBS/ACRE)</th>
<th>% Moisture</th>
</tr>
</thead>
<tbody>
<tr>
<td>Plot #1</td>
<td>12/17/04</td>
<td>.569</td>
<td>512</td>
<td>13</td>
</tr>
<tr>
<td>Plot #2</td>
<td>12/17/04</td>
<td>1.34</td>
<td>440</td>
<td>13</td>
</tr>
</tbody>
</table>

7. **Conditions**
The intention of the SARE grant was to provide farmers with options for growing crops under dryer conditions. Unfortunately, the research was performed under two of the wettest years on record in Central Pennsylvania. The excessive amounts of moisture effected the test results. We are certain that the test weight of the buckwheat was much lower than normal, because of these conditions. It is also suspected that the outcome of the grain sorghum tests drastically declined because of the weather conditions.

8. **Economics**
Because of the current value of Nitrogen, fertilizer costs nearly doubled from the grant budget.

**Corn- Grain Sorghum**

Sorghum requires only 2/3 the cost of corn of initial investment.

<table>
<thead>
<tr>
<th>Corn (Cost/Acre)</th>
<th>Sorghum (Cost/Acre)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Seed $26 (26,000 seeds)</td>
<td>$9.65 (110,000 seeds)</td>
</tr>
</tbody>
</table>

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Fertilizer $41.50 (150 lbs starter, 75 units N) $31.30 (150 lbs starter, 45N)
Spray $24 (Roundup, Steadfast, Atrazine) $15 (Atrazine, 2-4D, Roundup)

*Total Costs* $91.50 $55.95

**Oat-Clover**

Despite the fact that the clover yielded less than the non-clover, because of the high cost of nitrogen, it is still more economically feasible to underseed oats (or wheat) with clover. Eight dollars and thirty-eight cents was gained per acre by underseeding oats with clover. However, the most valuable benefit of this trial was the building of soil structure because clover adds organic matter to the soil.

<table>
<thead>
<tr>
<th></th>
<th>Oat-Clover</th>
<th>Oat</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nitrogen Costs/Acre</td>
<td>$0.00</td>
<td>$25.50 (75 units @ $.33/unit)</td>
</tr>
<tr>
<td>Seed Costs/Acre</td>
<td>$6.72 ($2.20/bu)</td>
<td>$0.00</td>
</tr>
<tr>
<td>Application Cost (N)</td>
<td>$0.00</td>
<td>$5.00</td>
</tr>
<tr>
<td>Gross $/Acre ($2.20/bu)</td>
<td>$151.14</td>
<td>$161.54</td>
</tr>
<tr>
<td>Net Profit/Acre</td>
<td>$144.42</td>
<td>$136.04</td>
</tr>
</tbody>
</table>

**Buckwheat**

The project triggered additional net farm income particularly through the buckwheat tests. Despite the weather conditions, resulting in lower test weights, the buckwheat plot proved successful and netted additional income. In addition, it was discovered that buckwheat creates a nice seedbed for planting the next year’s crop.

**Barley-Grain Sorghum**
This test seems to not be economically feasible because of the short growing season in Pennsylvania. However, under normal weather conditions, this may be successful.

9. Assessment
   Corn-Grain Sorghum
   Unfortunately, because of the weather condition under which the research was conducted, the results are inconclusive. Despite the unsuccessful results, these tests will be run again on our own, because we feel this is a option for growing.

   Oat-Clover
   Through this research, we will continue to underseed wheat and oats to provide Nitrogen in the soil.

   Buckwheat
   This research proved successful. We’ve learned to avoid no-tilling buckwheat, since both years’ yields were so poor that they were deemed not worth harvesting. However, buckwheat is a viable and feasible double crop to grow in Central Pennsylvania. As a single crop, buckwheat does not provide enough income per acre to justify growing.

   Barley-Grain Sorghum
   Unfortunately, because of the weather condition under which the research was conducted, the results are inconclusive. However, through these studies, we’ve concluded that this is not a viable option because of the growing season in Central Pennsylvania.

10. Adoption
   Corn-Grain Sorghum
   This segment of the test will continue in our farming operation. Central Pennsylvania has an excellent market for grain sorghum, which is used in birdseed. We will continue to grow grain sorghum because it seems as if it is a good hedge against dry weather.

   Oat-Clover
This segment of our test will continue in our farming operation. Using this test as a regular practice will assist us in defraying some of the costs of fertilizer, which is continually rising. In addition, the fringe benefits are provided to the soil by building up the soil composition through additional organic matter.

Buckwheat
This segment of our test will continue in our farming operation. Buckwheat is the first crop that we've found successful as a double crop. Hopefully the use of double crops will help justify rising land rents. In addition, buckwheat seems to loosen the soil and frees phosphorus, which works to promote soil health.

Barley-Grain Sorghum
Even though this test may work under perfect conditions, this is not feasible for our farming operation, because of the length of growing season.

11. Outreach
In October, in cooperation with Juniata County Extension, we held a field day to inspect the plots and field questions from interested producers in our area about the SARE grant research project. At the field day, we provided handouts about the field trials.

12. Report Summary
The purpose of the project was to prove that there are some non-traditional, more cost-effective ways of grain farming. Four separate test plots were performed: A cost-analysis comparison of growing corn to grain sorghum, the effectiveness of underseeding oats with clover as a source of Nitrogen, the most practical way of producing buckwheat as a double crop and the productiveness of doubling cropping grain sorghum after barley. Because of the wet growing conditions of the past two years, some of the results were inconclusive. However, the buckwheat trials were the most successful of the entire test. Buckwheat is most definitely a feasible option as a doublecrop. Underseeding oats (or wheat) with
alfalfa proved successful in two ways. The excess Nitrogen lowered input costs and the soil will find great benefits from the additional organic matter. The tests proved that growing grain sorghum after barley is not practical because of the length of growing season. Several of these practices will be incorporated into the regular farming operation of our farm because of the benefits to the soil, the lower input costs, and the marketability of the crops.

Jason Pontius
March 15, 2005