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**Innovation Grant Final Report**

PROJECT TITLE: Economic Benefit of Variable Rate Nitrogen Programs

REPORTING PERIOD: Final Report 2019

FARMER INNOVATOR: Sam Peterson

COLLABORATING ORGANIZATION/PERSON: Central Advantage GS, Encirca, Winfield Solutions: R7, 3P Farms

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1.) PROJECT ACTIVITIES COMPLETED DURING THE REPORTING PERIOD. (*Describe project progress specific to goals, objectives, and deliverables identified in your project proposal.*)

Specific goals of this reporting period were to organize all of the data and observations collected this year and analyze it to get usable, significant results. This would include the total cost of all treatments including fertilizer costs broken down by treatment and their respective fees for each treatment. Then compare the costs to the yield of each treatment to get a true economic analysis.

2.) IDENTIFY ANY SIGNIFICANT FINDINGS AND RESULTS OF THE PROJECT. (*This could include photo documentation of the project at various stages if you haven’t already provided these as well as final relevant images of the project at completion. Any data analysis (especially Level 3 Grants), graphics or record of observations throughout the growing season or during the field day event are also anticipated.)*

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Flat Rate** | **101** | **204** | **301** | **403** | **502** | **AVERAGE** | **Weighted $/#N** |  |
| **# 46-0-0 Top Dress** | 152.18 | 153.28 | 148.29 | 152.67 | 152.62 |  |  |  |
| **46-0-0 $/Ac** | $ 26.25 | $ 26.44 | $ 25.58 | $ 26.34 | $ 26.33 |  |  |  |
| **Program $/Ac** | $ - | $ - | $ - | $ - | $ - |  |  |  |
| **Total $/Acre** | $ 26.25 | $ 26.44 | $ 25.58 | $ 26.34 | $ 26.33 | $ 26.19 |  |  |
|  |  |  |  |  |  |  |  |  |
| **Yield** | 186.74 | 172.73 | 175.24 | 156.47 | 201.02 | 178.44 |  |  |
| **Total # of N** | 173.37 | 173.88 | 171.58 | 173.60 | 173.58 | 173.20 | $0.3677 |  |
| **Total # of N per bu** | 0.9284 | 1.0067 | 0.9791 | 1.1095 | 0.8635 | 0.9774 |  |  |
|  |  |  |  |  |  |  |  |  |
| **R7** | **102** | **202** | **304** | **404** | **503** | **AVERAGE** |  |  |
| **# 46-0-0 Top Dress** | 130.68 | 155 | 111.92 | 134.91 | 129.6 |  |  |  |
| **46-0-0 $/Acre** | $ 22.54 | $ 26.74 | $ 19.31 | $ 23.27 | $ 22.36 |  |  |  |
| **Program $/Ac** | $ 5.00 | $ 5.00 | $ 5.00 | $ 5.00 | $ 5.00 |  |  |  |
| **Total $/Acre** | $ 27.54 | $ 31.74 | $ 24.31 | $ 28.27 | $ 27.36 | $ 27.84 |  |  |
|  |  |  |  |  |  |  |  |  |
| **Yield** | 184.81 | 169.47 | 172.01 | 142.71 | 151.17 | 164.03 |  |  |
| **Total # of N** | 163.48 | 174.67 | 154.85 | 165.43 | 162.99 | 164.28 | $0.3673 |  |
| **Total # of N per bu** | 0.8846 | 1.0307 | 0.9003 | 1.1592 | 1.0782 | 1.0106 |  |  |
|  |  |  |  |  |  |  |  |  |
| **NitrateNow** | **103** | **203** | **303** | **401** | **504** | **AVERAGE** |  |  |
| **# 46-0-0 Top Dress** | 173.48 | 170.59 | 140.57 | 148.17 | 109.32 |  |  |  |
| **46-0-0 $/Acre** | $ 29.93 | $ 29.43 | $ 24.25 | $ 25.56 | $ 18.86 |  |  |  |
| **Program $/Ac** | $ 7.00 | $ 7.00 | $ 7.00 | $ 7.00 | $ 7.00 |  |  |  |
| **Total $/Acre** | $ 36.93 | $ 36.43 | $ 31.25 | $ 32.56 | $ 25.86 | $ 32.60 |  |  |
|  |  |  |  |  |  |  |  |  |
| **Yield** | 184.45 | 175.19 | 178.47 | 186.52 | 173.50 | 179.63 |  |  |
| **Total # of N** | 183.17 | 181.84 | 168.03 | 171.53 | 153.66 | 171.65 | $0.3677 |  |
| **Total # of N per bu** | 0.9931 | 1.0380 | 0.9415 | 0.9196 | 0.8856 | 0.9556 |  |  |
|  |  |  |  |  |  |  |  |  |
| **Encirca** | **104** | **201** | **302** | **402** | **501** | **AVERAGE** |  |  |
| **# 46-0-0 Top Dress** | 298.69 | 320.49 | 317.77 | 322.22 | 290.16 |  |  |  |
| **46-0-0 $/Acre** | $ 51.52 | $ 55.28 | $ 54.82 | $ 55.58 | $ 50.05 |  |  |  |
| **Program $/Ac** | $ 10.00 | $ 10.00 | $ 10.00 | $ 10.00 | $ 10.00 |  |  |  |
| **Total $/Acre** | $ 61.52 | $ 65.28 | $ 64.82 | $ 65.58 | $ 60.05 | $ 63.45 |  |  |
|  |  |  |  |  |  |  |  |  |
| **Yield** | 228.64 | 219.61 | 210.79 | 230.94 | 219.00 | 221.80 |  |  |
| **Total # of N** | 240.77 | 250.80 | 249.54 | 251.59 | 236.84 | 245.91 | $0.3699 |  |
| **Total # of N per bu** | 1.0530 | 1.1420 | 1.1839 | 1.0894 | 1.0815 | 1.1100 |  |  |
|  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |
| **Summary** |  |  |  |  |  |  | **46-0-0 $/# Product** | $0.1725 |
|  | **Flat Rate** | **R7** | **NitrateNow** | **Encirca** |  |  | **$/#N** | $0.3750 |
| **Average Top Dress $/Ac** | $26.19 | $27.84 | $32.60 | $63.45 |  |  | **NH3 $/# Product** | $0.2975 |
| **Average Yield bu/Ac** | 178.44 | 164.03 | 179.63 | 221.80 |  |  | **$/#N** | $0.3628 |
| **Average Total #N/bu** | 0.9774 | 1.0106 | 0.9556 | 1.1100 |  |  | **Corn Price** | $3.9000 |
|  |  |  |  |  |  |  |  |  |
| **+/- bu/Ac vs Flat Rate** |  | -14.41 | 1.19 | 43.36 |  |  |  |  |
| **+/- $/Ac vs Flat Rate** |  | $1.66 | $6.42 | $37.27 |  |  |  |  |
| **+/- #'s N/bu Flat Rate** |  | 0.03 | -0.02 | 0.13 |  |  |  |  |
|  |  |  |  |  |  |  |  |  |
| **Gross $/Ac Difference** |  | -$56.18 | $4.63 | $169.09 |  |  |  |  |
| **Net $/Ac Difference vs Flat Rate** |  | -$57.84 | -$1.79 | $131.82 |  |  |  |  |

The chart above breaks down all the results from every replication of the trial. The top four rows of each section are actual fertilizer costs per replication based on the as applied maps from the spreader during the topdress application. The bottom three rows in each section are average yield for each replication based off yield derived from the combine monitor. Significant figures are the average yield from each trial which are highlighted in the summary portion of the chart. Encirca shows significantly higher yield than the other three treatments with an average of 221.8 bushels/acre compared to Nitrate Now’s 179.63 bu/A, R7’s 164.03 bu/A, and the flat rate with 178.44 bu/A. Economically, after deducting fertilizer expenses, Encirca was significantly more profitable. Even after have much higher fertilizer expenses, it was $131.82 more profitable per acre to use the Encirca program over a flat rate program based on a $3.90 cash price for corn. The other two programs, Nitrate Now and R7, were actually less profitable per acre than the flat rate treatment. Based on these results, Encirca was the most accurate in predicting weather forecasts for the year by predicted heavy rainfalls which would leach away available nitrogen later in the season. Therefore, Encirca recommended applying significantly more nitrogen and in return had higher yields to generate a high return on investment for those fertilizer dollars.

3.) CHALLENGES ENCOUNTERED. (*Describe any challenges that you encountered related to project progress specific to goals, objectives, and deliverables identified in the project proposal.*)

Challenges we encountered were deciding what prices to hold constant in the results section. The cost of fertilizer and the cash price of corn sold can vary farm to farm. Anyone analyzing the results should be encouraged to plug in their own fertilizer and cash corn prices to see how it may turn out on their own farm.

4.) EDUCATION AND OUTREACH ACTIVITES. *(Describe any opportunities to engage with farmers, influencers or the media about your project.)*

Minnesota Ag Expo poster, talked with a handful of farmers at a county insurance meeting that had topics based on land stewardship practices.

5.) HOW CAN WE HELP? *(Please let us know how we can improve the experience for the next generation of projects.)*

I loved the project! Wouldn’t change a thing.