NRCS CONSERVATION INNOVATION GRANT

Final Report

Grantee Entity Name: B.F. Smith Foundation dba Delta F.A.R.M.
Project Title: Mississippi's Soil Health Initiative: fostering awareness, belief and understanding through local experience and evaluation.
Agreement Number: 69-3A75-14-232
Project Director: Dan Prevost
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Project End Date: August 31, 2017

Summary

Advancing soil health and cover crops in Mississippi has been a challenging endeavor over the past decade. Despite the efforts of NRCS and NGO's such as Delta F.A.R.M., growing farmer interest has consistently been met with criticism by most university and agricultural industry representatives. This project was intended to and has demonstrated success implementing cover crop – minimal tillage production systems that improve soil health. This report will cover achievements and successes of this project, leveraged resources, and also unexpected challenges and findings. The following bullet points summarize project achievements:

- Leveraged resources to demonstrate cover crop planting and management on approximately 9,500 acres across 130 fields and 40 farms.
- Conducted 48 field tours for producers, technical specialists, ag industry, regulators, and policy makers.
- Developed new knowledge for successful planting of cover crops on raised beds in furrow irrigated systems.
- Through field scale evaluations and replicated strip trials came to the understanding that terminating covers four weeks prior to cash crop planting inhibits the ability to attain in-season economic benefits.
    - This finding altered the course of future work to focus on maximizing cover crop growth and biomass production.
- Developed of multi-crop enterprise budgets for raised bed dry land, furrow and pivot irrigated systems.
- Successfully integrated livestock grazing winter cover crops on traditional row crop production land. Developed a row-crop/livestock producer network to sustain these activities.
- Developed a web-based soil health "Toolbox" containing print and electronic outreach materials and information for the advancement of soil health in Mississippi.
- Formation of a Farming Systems Research Team focusing on Soil Health and Regenerative Agriculture with representatives from Delta F.A.R.M., NRCS, Mississippi State University, and Southern Ag Consulting.

Demonstration and Evaluation

Planning and implementation of project activities began immediately after receipt of the signed CIG agreement on September 26, 2014. Given one of the primary components of the project involved the planting of winter cover crops, it was imperative to start immediately. Delta F.A.R.M. first developed scenarios in which cover crops would be evaluated or demonstrated and then located farm cooperators who would allow us to utilize their field(s). Between the 2014-2016 cover crop seasons, approximately 9,500 acres of cover crops were planted on 130 fields with the cooperation of over 40 growers. Additionally, during the summer of 2016, summer cover crops were planted on approximately 300 acres to evaluate planting methods, growth and survival of various seeds and blends. The extent of acres impacted could not have been achieved without the leveraged support of key partners such as the Mississippi Department of Environmental Quality and Monsanto. Additionally, interest among local producers has drastically increased since the projects inception and many more acres will be planted by these local producers. In fact, a national cover crop seed supplier recently indicated that the Mississippi Delta region was leading in cover crop seed sales for the southeast region.
Initially, proposed project activities included 2,400 acres and 12 growers over three years. It is very encouraging to see this primary deliverable being not only met, but exceeded with ease.

These field demonstrations provided ample opportunity for outreach activities. Forty eight field tours were held and attended by a diverse audience ranging from producers to congressional staffers. A complete listing of field tours and attendees is included as Attachment A. In-field evaluation activities were a key component of many of these tours. Simple tools such as a shovel and a penetrometer provided valuable insight into the physical and biological processes involved with improving soil health through cover crops and minimal tillage. Rachel Stout Evans, NRCS Soil Scientist and MLRA Project Leader, was instrumental in leading and providing guidance for the in-field evaluations. Knowledge gained through these exercises has been incorporated into the “Toolbox” which is discussed in a following section.

Field scale cover crop demonstrations and evaluations performed through this project were managed following University guidelines, which called for termination four weeks prior to planting. After three seasons, it is apparent that early termination results in low to moderate cover crop biomass which rapidly decomposes in our wet and warm climate. In turn, potential benefits to the production system are limited. For example, two of the greater opportunities for agronomic benefits and economic savings are associated with biological nitrogen production and weed suppression. Both of these factors have the potential to increase crop yield while decreasing input costs. However, early termination of legumes (prior to flowering) reduces nitrogen fixation potential. Additionally, the rapid decomposition of cover crop residue reduces effective weed control.

Ag Industry Engagement

This success is due not only to the cooperating producers, but also agricultural industry collaborators such as Jimmy Sanders Inc, Monsanto Company, and Cover Crop Solutions. Monsanto Company provided $100,000 cash investment into the initiative which allowed us to expand the project scope dramatically in year one. Jimmy Sanders provided in-kind assistance through the use of the OptiGro program for farm data management and also provided baseline soil sampling on cover crop fields free of charge (Mehlic 3 and Haney Test). Cover Crop Solutions provided technical guidance for proper seed selection, planting and management of cover crops in order to maximize the opportunity for success. During 2015, Lacrosse Seed purchased Cover Crop Solutions and continues to be a supporter of the cover crop efforts. Pennington Seed and Local Seed Company have both greatly stepped up their efforts providing technical assistance to sales staff and producers. Crop Production Services, now Nutrien Ag, has also provided project support and producer outreach. While this industry engagement may seem trivial to some, it has been a tremendous help in advancing awareness and knowledge regarding the use of cover crops to improve soil health in Mississippi.

Leveraged Research

This project supported initiation of a cover crop/soybean trial under the guidance of Dr. John Orlowski, Extension Soybean Specialist for Mississippi State University. During 2015-2016 and 2016-2017 replicated strip trials of cereal rye, tillage radish, and Austrian winter pea were planted in Issaquena County, MS at both low and high planting rates in a raised-bed, furrow irrigated production system. Cover crops were terminated following University recommendations four weeks prior to cash crop planting. For both years of the project, no statistical or practical differences were documented for any of the measured parameters. While this finding provided confidence in planting and managing cover crops in a raised-bed setting without adverse impacts to crop production, it also reinforced the findings of field scale trials documenting the lack of economic gain through the use of early terminated cover crops.

Dr. Jason Krutz at Mississippi State University conducted irrigation trials on three of the evaluation field through the Row-Crop Irrigation Science and Extension Research (RISER) program. At the time of irrigation initiation (June) little to no cover crop residue could be observed in the fields. Although soil moisture sensors measured a slight increase in infiltration and water holding capacity, it was not enough to reduce the amount of irrigations or the volume of water applied in these trials.

Economics

Field activities and conditions were noted in order to develop multi-crop enterprise budgets for raised bed production systems utilizing cover crops. These budgets are included as Attachment B. These budgets represent the unanticipated challenges associated with the early termination issues previously mentioned. With no measurable input reductions (irrigation, nutrients, pesticides) and increased costs associated with planting and terminating cover crops, projected net returns are lower than those projected under farmer's current production systems. This has been a crucial factor shaping subsequent soil health research and demonstrating activities.

"Toolbox"

Another major project activity was the development of a web-based "Toolbox" housing education and outreach information. A website (www.mscovercrop.com) has been developed to host information pertaining to the Mississippi Healthy Soils Initiative. The "Toolbox" was originally intended to and has hosted fact sheets supporting the successful integration of cover crops. Through disseminating this information to producers over the years, we've realized the necessity of delivering specific information to fit specific scenarios. For example, most all cover crop companies offer their "book" or "resource manual" containing more information than a producer may need which can be overwhelming. Through this understanding and collaboration between Rachel Stout Evans (NRCS Soil Scientist), Alayna Jacobs (NRCS Jamie L. Whitten Plant Materials Center), and Delta F.A.R.M. the "Toolbox" is being upgraded to allow producers to define parameters such as soil type, irrigation, field preparation, cash crop(s), goals and objectives in order receive information that fits their specific situation and needs.

Livestock Integration

One additional development in the project has been the integration of livestock through rotational grazing on winter cover crops. A pilot project was conducted on Norway Farms in Yazoo County to evaluate the practicality of this approach. 440 row-crop acres with a winter cover crop of triticale, winter pea, and radish were temporarily fenced and grazed using Adaptive High stock Density (AHD) techniques. 120 head of mixed stocker cattle were grazed for 60 days with an average daily gain of 2.9 lbs. Despite the many challenges faced, including a 4" rain and 30 degree temperatures the day after the cattle arrived, the pilot was deemed a success. Post-grazing soil condition evaluation revealed minimal compaction, and the 2016 corn yields were 25 bushels higher than the overall farm average. The success of this trial has extended into subsequent summer and winter grazing rotations on Delta row-crop land. Development of a row crop – livestock producer network has been facilitated to continue advancing the integration of livestock into row crop production systems. While there are many challenges associated with this, namely the near complete loss of infrastructure to support livestock in the Delta, we feel this is a real opportunity for gaining tremendous improvements in soil health.

Conclusion and Lasting Impact

Overall, this project was the catalyst for a still-increasing effort advancing soil health and sustainable agriculture in Mississippi. The large-scale demonstration of successful cover crop integration, despite the lack of documented economic return, provided confidence and encouragement for many producers who were "on the fence". Many of these producers, who also represent agricultural research councils and commodity boards, have helped drive local funding towards soil health research which has facilitated greater engagement at the University level. This project also identified key shortcomings in our approach to improving soil health, particularly cover crop termination and biomass. This reinforced the need for true systems-scale research in order to advance soil health. All of these factors combined has resulted in the formation of a Farming Systems Research Team focused on sustainable agricultural through advancing Soil Health and Regenerative Agricultural Practices. This interdisciplinary team consists of soil scientists, agronomists, entomologists, microbiologists, systems engineers, and conservationists

from NRCS, Mississippi State University, Delta F.A.R.M., and Southern Ag Consulting. Collectively, through on-farm systems research, this team is using precision agriculture and machine learning to: 1) identify yield factors in cover crop – minimal tillage production systems; 2) investigate plant-microbe and soil health parameters for the improvement of yield factors; and 3) adaptively implement and manage cover crop – minimal tillage production systems for evaluation against farmer's current best management production systems. As these summarized efforts hopefully demonstrate, this project has and will continue to advance soil health efforts in Mississippi.

Attachment A Field Tours

September 17, 2014 – Norway Farms
Dan Prevost (Delta F.A.R.M.)
Rob Coker (Producer)
Rachel Stout Evans
(NRCS) Doreen Muzzi
(Media)

October 1, 2014 – Prewitt Farms
Dan Prevost (Delta F.A.R.M.)
Bern Prewitt Jr. (Producer)
Chism Craig (CrescoAg)

January 23, 2015 – Norway Farms
Dan Prevost (Delta F.A.R.M.)
Ben Scaggs (Director, EPA Gulf of Mexico Program)

January 27, 2015 – Prewitt Farms
Bern Prewitt Jr. (Producer)
Michael Lott (Syngenta)
Brad Whatley (Jimmy Sanders)

January 21, 2015 – Johnson Farms & Prewitt Farms
Tim Huggins (Delta F.A.R.M.)
Buddy Allen (Producer)
Forrest Laws (Media)
Chip Graham (Bayer Crop Science)
Jim Jones (EPA Assistant Administrator for Office of Chemical Safety and Pollution Prevention) Yu-Ting Guilaran (EPA Director of Biological and Economic Analysis Division)

February 6, 2015 – Norway Farms
Dan Prevost (Delta F.A.R.M.)
Robert Bonnie (USDA Under Secretary for Natural Resources and Environment)
Kurt Readus (MS NRCS State Conservationist)
Homer Wilkes (USDA Director of the Gulf of Mexico Ecosystem Restoration Division)
Delmar Stamps (MS NRCS State Resource Conservationist)
Glenda Clardy (MS NRCS State Wildlife Biologist)
Kevin Kennedy (MS NRCS Area Conservationist)
Delaney Johnson (MS NRCS State Soil Scientist)

March 3, 2015 – Prewitt Farms
Dan Prevost (Delta F.A.R.M.)
John Brooks (USDA-ARS)

March 4, 2015 – Stovall Farms
Dan Prevost (Delta F.A.R.M.)
Will Griffin (S.N.F. Holdings)

April 16, 2015 – Nelson-King Farms
Dan Prevost (Delta F.A.R.M.)
Rachel Evans (USDA-NRCS)
George King (Producer)

April 29, 2015 – Norway Farms
Dan Prevost (Delta F.A.R.M.)
MDEQ Staff
Region 4 EPA Staff

June 3, 2015 – MSU DREC
Delta Sustainable Water Resources Task Force

June 9, 2015 – Lake Washington
Dan Prevost (Delta F.A.R.M.)
Aubrey Harris (landowner)
David Whitehead (landowner)

August 11, 2015 – Stovall Farms
Dan Prevost (Delta F.A.R.M.)
Pete Hunter (Producer)
Jason Krutz (MSU)
Kay Whittington (MDEQ)
U.S. Soybean Board Representatives Media

August 12, 2015 –Delta Wide
Dan Prevost (Delta F.A.R.M.)
Rachel Evans (USDA-NRCS)
Clark Carter (Producer)
Bern Prewitt (Producer)
Rob Coker (Producer)

August 18, 2015 – Stovall Farms
Delta F.A.R.M. Staff
Delta Council Staff
21 U.S. Congressional Staffers

September 28, 2015 – Carter Brothers Farm
Dan Prevost (Delta F.A.R.M.)
Clark Carter (producer)
John Orlowski (MSU)

October 1, 2015 – Prewitt Farms
Dan Prevost (Delta F.A.R.M.)
Bern Prewitt (producer)
Jimmy Sanders Inc (salesmen)

October 15, 2015 – Cypress Brake Farms
Dan Prevost (Delta F.A.R.M.)
Michael Owens (planter)
John Orlowski (MSU)

October 16, 2015 – Carter Brothers Farms
Dan Prevost (Delta F.A.R.M.)
Michael Owens (planter)
John Orlowski (MSU)

October 26, 2015 – Prewitt Farms
Dan Prevost (Delta F.A.R.M.)
Bern Prewitt (producer)
Fred Roark (pilot)

November 12, 2015 – Cruger
Dan Prevost (Delta F.A.R.M.)
Joseph Acosta (landowner)

January 5, 2016 – Norway Farms
Dan Prevost (Delta F.A.R.M.)
Allen Williams (consultant)
Rob Coker (producer)
Michael Owens (grazer)

January 22, 2016 – Taylor Farms
Dan Prevost (Delta F.A.R.M.)
Bern Prewitt (producer)
Rob Coker (producer)
Michael Owens (grazer)
Mike Taylor (producer)
Michael Taylor (producer)

February 9, 2016 -Rutherford Farms
Dan Prevost (Delta F.A.R.M.)
Rachel Evans (USDA-NRCS)
Jon Carson (MSU)
Bill Rutherford (producer)
Will Rutherford (producer)

March 3, 2016 – Norway Farms
Dan Prevost (Delta F.A.R.M.)
Tim Huggins (Delta F.A.R.M.)
Caydee Savinelli (Syngenta)
Troy Pierce (EPA Gulf of Mexico Program)

May 9, 2016 – Prewitt Farms
Dan Prevost (Delta F.A.R.M.)
Joby Czarnecki (MSU)
Chris Ellingsworth (Textron)

May 18, 2016 – Norway Farms
Dan Prevost (Delta F.A.R.M.)
Rob Coker – Producer
Allen Williams – Consultant
Ray Archuleta - NRCS

May 24, 2016 – Burkes Land Company
Dan Prevost (Delta F.A.R.M.)
Chip Morgan (Delta Council)
Kent Parrish (USACE)
23 participants MS Water Security Institute

May 25, 2016 – Norway Farms
Dan Prevost (Delta F.A.R.M.)
Rob Coker (producer)
John Carpenter (Pennington)
Al Hubbard (Pennington)
Jacob Barnes (Pennington)

May 26, 2016 – Stovall Farms
Dan Prevost (Delta F.A.R.M.)
Pete Hunter (producer)
Kevin Kennedy (NRCS)
Don Underwood (MS SWCC)
50 American Farm Bureau Environmental Staff

June 1, 2016 – Prewitt Farms
Dan Prevost (Delta F.A.R.M.)
Bern Prewitt (producer)
Will Hightower (Mannco Environmental)

June 15, 2016 – Greenland Plantation
Delta F.A.R.M. staff
Rachel Evans (NRCS)
Jason Krutz (MSU)
Paul Dees (Producer)
Dan Branton (Producer)
Travis Satterfield (Producer)
Dan Campbell, Todd Barlow (Syngenta)
Liz Hunt, Reagan Despain (Syngenta)
Caydee Savinelli, Mark White (Syngenta)

June 16, 2016 – Stovall Farms
Delta F.A.R.M. staff
Pete Hunter - Producer
Buddy Allan - Producer
Rodge Rodgers - Producer
Dan Campbell, Todd Barlow (Syngenta)
Liz Hunt, Reagan Despain (Syngenta)
Caydee Savinelli, Mark White (Syngenta)

August 23, 2016 – Crumpton Farms
Rachel Evans - NRCS
Delta F.A.R.M. Staff
Delta Council Staff
26 U.S. Congressional Staffers

September 20, 2016 – Kin Growers
Bill Rutherford – Producer
Will Rutherford – Producer
Delta F.A.R.M. Staff
Helena Chemical Representatives

January 17, 2017 – Norway Farms
Rob Coker – Producer
Delta F.A.R.M. Staff
Al Hubbard – Pennington Seed

January 19, 2017 – Prewitt Farms
Bern Prewitt Jr. – Producer
Delta F.A.R.M. Staff
Andrew Lewis – Southern Ag Consulting

February 13, 2017 – Shelton Farms
Delta F.A.R.M. Staff
Miller King, Wes McPherson – Southern Ag Consulting
Koko Rowland – Producer
Hunter Hayes – Mississippi State University Student

February 28, 2017 – Stovall Farms
Delta F.A.R.M. Staff
John Mckee – Producer
Alayna Jacobs – NRCS Plant Materials Center
Jon Allison – NRCS Plant Materials Center
Ford True – Producer Andy Schmidt – Producer
Thomas Neblett – Producer

March 23, 2017 – Norway Farms
Delta F.A.R.M. Staff
Rob Coker – Producer
Michael Owens – Producer
Sammy Blossom – Media

March 24, 2017 – Shelton Farms
Delta F.A.R.M. Staff
Michael Owens – Producer
Koko Rowland – Producer
Walter Shelton – Producer

March 29, 2017 – Barrett Farms
Delta F.A.R.M. Staff
Miller King – Producer
Southern Ag Consulting
Will Marlow – Producer

March 29, 2017 – Simmons Farms
Delta F.A.R.M. Staff
Bubba Simmons – Producer
Jason Fratesi – Southern Ag Consulting

April 3, 2017 – Prewitt Farms
Delta F.A.R.M. Staff
11 Holmes Community College Soils Students

April 24, 2017 – Allendale Farms
Delta F.AR.M. Staff
Wayne Dulaney – Producer
Bill Oneil – Producer

June 6, 2017 – Stovall Farms
Delta F.A.R.M. Staff
Chism Craig – Producer, Crop Consultant

July 17, 2017 – Chappell Farms
Delta F.A.R.M. Staff
Adam Chappell – Producer
Andy Schmidt – Producer
Alan Blain– Southern Ag Consulting
Mit Wardlaw– Southern Ag Consulting
Andrew Lewis – Southern Ag Consulting
Ben Spinks – Southern Ag Consulting

July 25, 2017 – Bush Farms
Delta F.A.R.M. Staff
John Bush – Producer
David Bush – Producer

Attachment B Enterprise Budgets

Estimated costs and returns per acre Corn, conventional tillage, RR seed, 12-row 38"
3-5 Way Cover Crop Mix Aerial Seeded 170 bu yield goal, non-irrigated

ITEM	UNIT	PRICE	QUANTITY	Total Amount
INCOME				
Corn	bu	$ 3.76	170	$ 639.20
TOTAL INCOME				$ 639.20
DIRECT EXPENSES				
CUSTOM SPRAY				
App by Air (10 gal)	appl	$ 8.00	1	$ 8.00
App by Air (3 gal)	appl	$ 5.00	1.2	$ 6.00
FERTILIZERS				
Phosphorus(46% P2O5)	cwt	$ 18.75	1.63	$ 30.56
Potash (60% K2O)	cwt	$ 18.98	1.25	$ 23.73
UAN + Sulfur (28%)	gal	$ 1.31	19.3063	$ 25.29
UAN (32%)	gal	$ 1.17	29.67	$ 34.71
HERBICIDES				
Glyphosate 3lbs a.e	oz	$ 0.14	32	$ 4.48
Clarity	pt	$ 11.55	0.5	$ 5.78
Select Max	pt	$ 12.64	1	$ 12.64
Atrazine 4L	pt	$ 2.12	4	$ 8.48
Halex GT	pt	$ 7.80	3.6	$ 28.08
INSECTICIDES				

ITEM	UNIT	PRICE	QUANTITY	Total Amount
Bifenthrin	oz	$ 0.78	1.2804	$ 1.00
Intrepid 2F	oz	$ 2.00	4	$ 8.00
SEED/PLANTS				
Corn Seed RR2	thous	$ 3.24	28	$ 90.72
CUSTOM FERTILIZE				
Custom Apply Fert	acre	$ 7.50	1	$ 7.50
HAULING				
Haul Corn	bu	$ 0.23	170	$ 39.10
CUSTOM LIME				
Lime (Spread)	ton	$ 46.00	0.666	$ 30.64
CROP CONSULTANT				
Corn Consultant	acre	$ 6.00	1	$ 6.00
SOIL TEST				
Soil Test	acre	$ 10.00	0.333	$ 3.33
OPERATOR LABOR				
Tractors	hour	$ 13.51	0.5691	$ 7.69
Harvesters	hour	$ 13.51	0.101	$ 1.36
Self-Propelled	hour	$ 13.51	0.0176	$ 0.24
HAND LABOR				
Implements	hour	$ 9.06	0.1176	$ 1.07
Self-Propelled	hour	$ 9.06	0.0088	$ 0.08
UNALLOCATED LABOR	hour	$ 13.51	0.6189	$ 8.36
DIESEL FUEL				
Tractors	gal	$ 1.80	6.5904	$ 11.86
Harvesters	gal	$ 1.80	1.3771	$ 2.48
Self-Propelled	gal	$ 1.80	0.1587	$ 0.29
Cover Crop				
Cover Crop Seed	acre	$28.00	1	$ 28.00
Cover Crop Planting (aerial)	acre	$ 10.00	1	$ 10.00
REPAIR & MAINTENANCE				
Implements	acre	$ 7.75	1	$ 7.75
Tractors	acre	$ 3.75	1	$ 3.75
Harvesters	acre	$ 3.45	1	$ 3.45
Self-Propelled	acre	$ 0.18	1	$ 0.18
INTEREST ON OP. CAP.	acre	$ 11.73	1	$ 11.73
TOTAL DIRECT EXPENSES				$ 472.33
RETURNS ABOVE DIRECT EXPENSES				$ 166.87
FIXED EXPENSES				
Implements	acre	$ 12.08	1	$ 12.08
Tractors	acre	$ 23.52	1	$ 23.52
Harvesters	acre	$ 13.61	1	$ 13.61
Self-Propelled	acre	$ 1.20	1	$ 1.20
TOTAL FIXED EXPENSES				$ 50.41
TOTAL SPECIFIED EXPENSES				$ 522.74
RETURNS ABOVE TOTAL SPECIFIED EXPENSES				$ 116.46

Note: Cost of production estimates are based on 2017 input prices.

The mention in this report of any commercial product does not imply its endorsement by MSU-ES, MAFES, or USDA over other products not named nor does the omission imply they are not satisfactory.

Estimated costs and returns per acre Corn, stale seedbed, BtRR, 12row 38" 3-5 Way Cover Crop Mix Aerial Seeded 170 bu yield goal, non-irrigated

ITEM	UNIT	PRICE	QUANTITY	Total Amount
INCOME				
Corn	bu	$ 3.76	170	$ 639.20
TOTAL INCOME				$ 639.20
DIRECT EXPENSES				
CUSTOM SPRAY				
App by Air (10 gal)	appl	$ 8.00	1	$ 8.00
App by Air (3 gal)	appl	$ 5.00	0.2	$ 1.00
FERTILIZERS				
Phosphorus(46% P2O5)	cwt	$ 18.75	1.63	$ 30.56
Potash (60% K2O)	cwt	$ 18.98	1.25	$ 23.73
Fert 10-34-0	gal	$ 2.59	4.2919	$ 11.12
Zinc Plus	pt	$ 2.99	2	$ 5.98
UAN + Sulfur (28%)	gal	$ 1.31	19.3063	$ 25.29
UAN (32%)	gal	$ 1.17	29.67	$ 34.71
HERBICIDES				
Glyphosate 3lbs a.e	oz	$ 0.14	32	$ 4.48
Clarity	pt	$ 11.55	0.5	$ 5.78
Select Max	pt	$ 12.64	1	$ 12.64
Atrazine 4L	pt	$ 2.12	4	$ 8.48
Halex GT	pt	$ 7.80	3.6	$ 28.08
INSECTICIDES				
Bifenthrin	oz	$ 0.78	1.28	$ 1.00
SEED/PLANTS				
Corn Seed BtRR	thous	$ 3.63	28	$ 101.64
CUSTOM FERTILIZE				
Custom Apply Fert	acre	$ 7.50	1	$ 7.50
HAULING				
Haul Corn	bu	$ 0.23	170	$ 39.10
CUSTOM LIME				
Lime (Spread)	ton	$ 46.00	0.666	$ 30.64
CROP CONSULTANT				
Corn Consultant	acre	$ 6.00	1	$ 6.00
SOIL TEST				
Soil Test	acre	$ 10.00	0.333	$ 3.33
OPERATOR LABOR				
Tractors	hour	$ 13.51	0.3457	$ 4.67
Harvesters	hour	$ 13.51	0.101	$ 1.36
HAND LABOR				
Implements	hour	$ 9.06	0.1355	$ 1.23
UNALLOCATED LABOR	hour	$ 13.51	0.402	$ 5.43

DIESEL FUEL					
Tractors	gal	$ 1.80	4.004	$	7.21
Harvesters	gal	$ 1.80	1.3771	$	2.48
Cover Crop					
Cover Crop Seed	acre	$28.00	1	$	28.00
Cover Crop Planting (aerial)	acre	$ 10.00	1	$	10.00
REPAIR & MAINTENANCE					
Implements	acre	$ 7.32	1	$	7.32
Tractors	acre	$ 2.28	1	$	2.28
Harvesters	acre	$ 3.45	1	$	3.45
INTEREST ON OP. CAP.	acre	$ 11.74	1	$	11.74
TOTAL DIRECT EXPENSES				$	474.23
RETURNS ABOVE DIRECT EXPENSES				$	164.97
FIXED EXPENSES					
Implements	acre	$ 10.56	1	$	10.56
Tractors	acre	$ 14.30	1	$	14.30
Harvesters	acre	$ 13.61	1	$	13.61
TOTAL FIXED EXPENSES				$	38.47
TOTAL SPECIFIED EXPENSES				$	512.70
RETURNS ABOVE TOTAL SPECIFIED EXPENSES				$	126.50

Note: Cost of production estimates are based on 2017 input prices.

The mention in this report of any commercial product does not imply its endorsement by MSU-ES, MAFES, or USDA over other products not named nor does the omission imply they are not satisfactory.

Estimated costs and returns per acre Corn, conventional tillage, RR seed, 12-row 38", 3-5 Way Cover Crop Mix Aerial Seeded 210 bu yld goal, Furrow Irrigated, 13 ac-in.

ITEM	UNIT	PRICE	QUANTITY	Total Amount
INCOME				
Corn	bu	$ 3.76	210	$ 789.60
TOTAL INCOME				$ 789.60
DIRECT EXPENSES				
CUSTOM SPRAY				
App by Air (10 gal)	appl	$ 8.00	1	$ 8.00
App by Air (3 gal)	appl	$ 5.00	1.2	$ 6.00
FERTILIZERS				
Phosphorus(46% P2O5)	cwt	$ 18.75	1.957	$ 36.69
Potash (60% K2O)	cwt	$ 18.98	1.5	$ 28.47
UAN + Sulfur (28%)	gal	$ 1.31	32.1712	$ 42.14
UAN (32%)	gal	$ 1.17	39.557	$ 46.28
HERBICIDES				
Glyphosate 3lbs a.e	oz	$ 0.14	32	$ 4.48
Clarity	pt	$ 11.55	0.5	$ 5.78
Select Max	pt	$ 12.64	1	$ 12.64
Atrazine 4L	pt	$ 2.12	4	$ 8.48
Halex GT	pt	$ 7.80	3.6	$ 28.08
INSECTICIDES				
Bifenthrin	oz	$ 0.78	1.2804	$ 1.00
Intrepid 2F	oz	$ 2.00	4	$ 8.00
IRRIGATION SUPPLIES				
Roll-Out Pipe	ft	$ 0.25	33	$ 8.25
SEED/PLANTS				
Corn Seed RR2	thous	$ 3.24	34	$ 110.16
CUSTOM FERTILIZE				
Custom Apply Fert	acre	$ 7.50	1	$ 7.50
HAULING				
Haul Corn	bu	$ 0.23	210	$ 48.30
CUSTOM LIME				
Lime (Spread)	ton	$ 46.00	0.666	$ 30.64
CROP CONSULTANT				
Corn Consultant	acre	$ 6.00	1	$ 6.00
SOIL TEST				
Soil Test	acre	$ 10.00	0.333	$ 3.33
OPERATOR LABOR				
Tractors	hour	$ 13.51	0.693	$ 9.36
Harvesters	hour	$ 13.51	0.101	$ 1.36
Self-Propelled	hour	$ 13.51	0.0176	$ 0.24
IRRIGATE LABOR				
Special Labor	hour	$ 9.06	0.325	$ 2.94
Implements	hour	$ 9.06	0.0625	$ 0.57

HAND LABOR					
Implements	hour	$ 9.06	0.1176	$	1.07
Self-Propelled	hour	$ 9.06	0.0088	$	0.08
UNALLOCATED LABOR	hour	$ 13.50	0.6598	$	8.91
DIESEL FUEL					
Tractors	gal	$ 1.80	7.8429	$	14.12
Harvesters	gal	$ 1.80	1.3771	$	2.48
Self-Propelled	gal	$ 1.80	0.1587	$	0.29
Roll-Out Pipe Irr.	gal	$ 1.80	10.5902	$	19.06
Cover Crop					
Cover Crop Seed	acre	$28.00	1	$	28.00
Cover Crop Planting (aerial)	acre	$ 10.00	1	$	10.00
REPAIR & MAINTENANCE					
Implements	acre	$ 9.22	1	$	9.22
Tractors	acre	$ 4.44	1	$	4.44
Harvesters	acre	$ 3.45	1	$	3.45
Self-Propelled	acre	$ 0.18	1	$	0.18
Roll-Out Pipe Irr.	acre	$ 6.88	1	$	6.88
INTEREST ON OP. CAP.	acre	$ 14.18	1	$	14.18
TOTAL DIRECT EXPENSES				$	587.05
RETURNS ABOVE DIRECT EXPENSES				$	202.55
FIXED EXPENSES					
Implements	acre	$ 16.10	1	$	16.10
Tractors	acre	$ 27.90	1	$	27.90
Harvesters	acre	$ 13.61	1	$	13.61
Self-Propelled	acre	$ 1.20	1	$	1.20
Roll-Out Pipe Irr.	acre	$ 53.42	1	$	53.42
TOTAL FIXED EXPENSES				$	112.23
TOTAL SPECIFIED EXPENSES				$	699.28
RETURNS ABOVE TOTAL SPECIFIED EXPENSES				$	90.32

Note: Cost of production estimates are based on 2017 input prices.

Estimated costs and returns per acre Corn, stale seedbed, BtRR, 12-row 38" 3-5 Way Cover Crop Mix Aerial Seeded 210 bu yield goal, Furrow Irrigated, 13 ac-in.

ITEM	UNIT	PRICE	QUANTITY	Total Amount
INCOME				
Corn	bu	$ 3.76	210	$ 789.60
TOTAL INCOME				$ 789.60
DIRECT EXPENSES				
CUSTOM SPRAY				
App by Air (10 gal)	appl	$ 8.00	1	$ 8.00
App by Air (3 gal)	appl	$ 5.00	0.2	$ 1.00
FERTILIZERS				
Phosphorus(46% P2O5)	cwt	$ 18.75	1.957	$ 36.69
Potash (60% K2O)	cwt	$ 18.98	1.5	$ 28.47
Fert 10-34-0	gal	$ 2.59	4.2919	$ 11.12
Zinc Plus	pt	$ 2.99	2	$ 5.98
UAN + Sulfur (28%)	gal	$ 1.31	32.1712	$ 42.14
UAN (32%)	gal	$ 1.17	39.557	$ 46.28
HERBICIDES				
Glyphosate 3lbs a.e	oz	$ 0.14	32	$ 4.48
Clarity	pt	$ 11.55	0.5	$ 5.78
Select Max	pt	$ 12.64	1	$ 12.64
Atrazine 4L	pt	$ 2.12	4	$ 8.48
Halex GT	pt	$ 7.80	3.6	$ 28.08
INSECTICIDES				
Bifenthrin	oz	$ 0.78	1.28	$ 1.00
IRRIGATION SUPPLIES				
Roll-Out Pipe	ft	$ 0.25	33	$ 8.25
SEED/PLANTS				
Corn Seed BtRR	thous	$ 3.63	34	$ 123.42
CUSTOM FERTILIZE				
Custom Apply Fert	acre	$ 7.50	1	$ 7.50
HAULING				
Haul Corn	bu	$ 0.23	210	$ 48.30
CUSTOM LIME				
Lime (Spread)	ton	$ 46.00	0.666	$ 30.64
CROP CONSULTANT				
Corn Consultant	acre	$ 6.00	1	$ 6.00
SOIL TEST				
Soil Test	acre	$ 10.00	0.333	$ 3.33
OPERATOR LABOR				

Tractors	hour	$ 13.51	0.4243	$	5.73
Harvesters	hour	$ 13.51	0.101	$	1.36
IRRIGATE LABOR					
Special Labor	hour	$ 9.06	0.325	$	2.94
Implements	hour	$ 9.06	0.0625	$	0.57
HAND LABOR					
Implements	hour	$ 9.06	0.1355	$	1.23
UNALLOCATED LABOR	hour	$ 13.51	0.402	$	5.43
DIESEL FUEL					
Tractors	gal	$ 1.80	4.7303	$	8.51
Harvesters	gal	$ 1.80	1.6891	$	3.04
Roll-Out Pipe Irr.	gal	$ 1.80	10.5902	$	19.06
Cover Crop					
Cover Crop Seed	acre	$28.00	1	$	28.00
Cover Crop Planting (aerial)	acre	$ 10.00	1	$	10.00
REPAIR & MAINTENANCE					
Implements	acre	$ 7.52	1	$	7.52
Tractors	acre	$ 2.67	1	$	2.67
Harvesters	acre	$ 3.73	1	$	3.73
Roll-Out Pipe Irr.	acre	$ 6.88	1	$	6.88
INTEREST ON OP. CAP.	acre	$ 14.17	1	$	14.17
TOTAL DIRECT EXPENSES				$	588.42
RETURNS ABOVE DIRECT EXPENSES				$	201.18
FIXED EXPENSES					
Implements	acre	$ 11.58	1	$	11.58
Tractors	acre	$ 16.81	1	$	16.81
Harvesters	acre	$ 14.73	1	$	14.73
Roll-Out Pipe Irr.	acre	$ 53.42	1	$	53.42
TOTAL FIXED EXPENSES				$	96.54
TOTAL SPECIFIED EXPENSES				$	684.96
RETURNS ABOVE TOTAL SPECIFIED EXPENSES				$	104.64

Note: Cost of production estimates are based on 2017 input prices.

Estimated costs and returns per acre Soybeans, full-season, LL, stale seedbed, 12R 30" 3-5 Way Cover Crop Mix Aerial Seeded Furrow irrigated, 9 ac-in.

ITEM	UNIT	PRICE	QUANTITY	Total Amount
INCOME				
Soybeans	bu	$ 9.90	60	$ 594.00
TOTAL INCOME				$ 594.00
DIRECT EXPENSES				
CUSTOM SPRAY				
App by Air (10 gal)	appl	$ 8.00	1	$ 8.00
App by Air (5 gal)	appl	$ 6.50	3	$ 19.50
HARVEST AIDS				
Gramoxone SL	oz	$ 0.15	16	$ 2.40
Sodium Chlorate 5L	gal	$ 5.39	0.6	$ 3.23
FERTILIZERS				
Phosphorus(46% P2O5)	cwt	$ 18.75	0.87	$ 16.31
Potash (60% K2O)	cwt	$ 18.98	1.33	$ 25.24
FUNGICIDES				
CruiserMaxx	oz	$ 4.25	1.6	$ 6.80
Quadris Top SBX	oz	$ 2.75	7	$ 19.25
HERBICIDES				
Glyphosate 3lbs a.e	oz	$ 0.14	32	$ 4.48
2,4-D Amine 4	pt	$ 2.40	2	$ 4.80
Select Max	pt	$ 12.64	1	$ 12.64
Valor SX	oz	$ 4.57	2	$ 9.14
Boundary	pt	$ 11.20	2	$ 22.40
Gramoxone SL 2.0	oz	$ 0.15	48	$ 7.20
Liberty 280	oz	$ 0.60	58	$ 34.80
Dual Magnum	pt	$ 13.80	1	$ 13.80
Zidua	oz	$ 9.05	1.5	$ 13.58
INSECTICIDES				
Acephate 90SP	lb	$ 7.43	0.75	$ 5.57
IRRIGATION SUPPLIES				
Roll-Out Pipe	ft	$ 0.25	33	$ 8.25
SEED/PLANTS				
Soybean Seed LL	lb	$ 1.28	50	$ 64.00
ADJUVANTS				
Surfactant	pt	$ 3.28	1.1	$ 3.61
CUSTOM FERTILIZE				
Custom Apply Fert	acre	$ 7.50	1	$ 7.50
HAULING				
Haul Soybeans	bu	$ 0.27	60	$ 16.20
CUSTOM LIME				
Lime (Spread)	ton	$ 46.00	0.333	$ 15.32
CROP CONSULTANT				

Soybeans Consultant	acre	$ 6.50	1	$	6.50
INOCULANT					
Optimize	oz	$ 2.14	1.4	$	3.00
SOIL TEST					
Soil Test	acre	$ 10.00	0.333	$	3.33
OPERATOR LABOR					
Tractors	hour	$ 13.51	0.4713	$	6.37
Harvesters	hour	$ 13.51	0.1022	$	1.38
IRRIGATE LABOR					
Special Labor	hour	$ 9.06	0.3	$	2.72
Implements	hour	$ 9.06	0.0625	$	0.57
HAND LABOR					
Implements	hour	$ 9.06	0.0959	$	0.87
UNALLOCATED LABOR	hour	$ 13.51	0.4455	$	6.02
DIESEL FUEL					
Tractors	gal	$ 1.80	5.2753	$	9.50
Harvesters	gal	$ 1.80	1.3936	$	2.51
Roll-Out Pipe Irr.	gal	$ 1.80	7.3317	$	13.20
Cover Crop					
Cover Crop Seed	acre	$28.00	1	$	28.00
Cover Crop Planting (aerial)	acre	$ 10.00	1	$	10.00
REPAIR & MAINTENANCE					
Implements	acre	$ 5.47	1	$	5.47
Tractors	acre	$ 2.98	1	$	2.98
Harvesters	acre	$ 3.49	1	$	3.49
Roll-Out Pipe Irr.	acre	$ 6.89	1	$	6.89
INTEREST ON OP. CAP.	acre	$ 10.39	1	$	10.39
TOTAL DIRECT EXPENSES				$	459.21
RETURNS ABOVE DIRECT EXPENSES				$	134.79
FIXED EXPENSES					
Implements	acre	$ 11.96	1	$	11.96
Tractors	acre	$ 18.75	1	$	18.75
Harvesters	acre	$ 13.77	1	$	13.77
Roll-Out Pipe Irr.	acre	$ 53.42	1	$	53.42
TOTAL FIXED EXPENSES				$	97.90
TOTAL SPECIFIED EXPENSES				$	557.11
RETURNS ABOVE TOTAL SPECIFIED EXPENSES				$	36.89

Note: Cost of production estimates are based on 2017 input prices.

The mention in this report of any commercial product does not imply its endorsement by MSU-ES, MAFES, or USDA over other products not named nor does the omission imply they are not satisfactory.

Estimated costs and returns per acre Soybeans, full-season, LL, stale seedbed, 12R 30" 3-5 Way Cover Crop Mix Aerial Seeded Non-irrigated

ITEM	UNIT	PRICE	QUANTITY	Total Amount
INCOME				
Soybeans	bu	$ 9.90	42	$ 415.80
TOTAL INCOME				$ 415.80
DIRECT EXPENSES				
CUSTOM SPRAY				
App by Air (10 gal)	appl	$ 8.00	1	$ 8.00
App by Air (5 gal)	appl	$ 6.50	2	$ 13.00
HARVEST AIDS				
Gramoxone SL	oz	$ 0.15	16	$ 2.40
Sodium Chlorate 5L	gal	$ 5.39	0.6	$ 3.23
FERTILIZERS				
Phosphorus(46% P2O5)	cwt	$ 18.75	0.87	$ 16.31
Potash (60% K2O)	cwt	$ 18.98	1.33	$ 25.24
FUNGICIDES				
CruiserMaxx	oz	$ 4.25	1.6	$ 6.80
HERBICIDES				
Glyphosate 3lbs a.e	oz	$ 0.14	32	$ 4.48
2,4-D Amine 4	pt	$ 2.40	2	$ 4.80
Select Max	pt	$ 12.64	1	$ 12.64
Valor SX	oz	$ 4.57	2	$ 9.14
Boundary	pt	$ 11.20	2	$ 22.40
Gramoxone SL 2.0	oz	$ 0.15	48	$ 7.20
Liberty 280	oz	$ 0.60	58	$ 34.80
Dual Magnum	pt	$ 13.80	1	$ 13.80
Zidua	oz	$ 9.05	1.5	$ 13.58
INSECTICIDES				
Acephate 90SP	lb	$ 7.43	0.75	$ 5.57
SEED/PLANTS				
Soybean Seed LL	lb	$ 1.28	50	$ 64.00
ADJUVANTS				
Surfactant	pt	$ 3.28	1	$ 3.28
CUSTOM FERTILIZE				
Custom Apply Fert	acre	$ 7.50	1	$ 7.50
HAULING				
Haul Soybeans	bu	$ 0.27	42	$ 11.34
CUSTOM LIME				
Lime (Spread)	ton	$ 46.00	0.333	$ 15.32
CROP CONSULTANT				
Soybeans Consultant	acre	$ 6.50	1	$ 6.50
INOCULANT				
Optimize	oz	$ 2.14	1.4	$ 3.00
SOIL TEST				

Soil Test	acre	$	10.00	0.333	$ 3.33
OPERATOR LABOR					
Tractors	hour	$	13.51	0.3303	$ 4.46
Harvesters	hour	$	13.51	0.1022	$ 1.38
HAND LABOR					
Implements	hour	$	9.06	0.0959	$ 0.87
UNALLOCATED LABOR	hour	$	13.51	0.3892	$ 5.26
DIESEL FUEL					
Tractors	gal	$	1.80	3.8253	$ 6.89
Harvesters	gal	$	1.80	1.3936	$ 2.51
Cover Crop					
Cover Crop Seed	acre		$28.00	1	$ 28.00
Cover Crop Planting (aerial)	acre	$	10.00	1	$ 10.00
REPAIR & MAINTENANCE					
Implements	acre	$	4.81	1	$ 4.81
Tractors	acre	$	2.18	1	$ 2.18
Harvesters	acre	$	3.49	1	$ 3.49
INTEREST ON OP. CAP.	acre	$	9.33	1	$ 9.33
TOTAL DIRECT EXPENSES					$ 388.84
RETURNS ABOVE DIRECT EXPENSES					$ 26.96
FIXED EXPENSES					
Implements	acre	$	9.73	1	$ 9.73
Tractors	acre	$	13.66	1	$ 13.66
Harvesters	acre	$	13.77	1	$ 13.77
TOTAL FIXED EXPENSES					$ 37.16
TOTAL SPECIFIED EXPENSES					$ 426.00
RETURNS ABOVE TOTAL SPECIFIED EXPENSES					$ (10.20)

Note: Cost of production estimates are based on 2017 input prices.

Estimated costs and returns per acre Soybeans, double crop after wheat, LL, 12R 30" 3-5 Way Cover Crop Mix Aerial Seeded Pivot irrigated, 7.5 ac-in.

ITEM	UNIT	PRICE	QUANTITY	Total Amount
INCOME				
Soybeans	bu	$ 9.90	50	$ 495.00
TOTAL INCOME				$ 495.00
DIRECT EXPENSES				
CUSTOM SPRAY				
App by Air (10 gal)	appl	$ 8.00	1	$ 8.00
App by Air (5 gal)	appl	$ 6.50	3	$ 19.50
FERTILIZERS				
Phosphorus(46% P2O5)	cwt	$ 18.75	0.87	$ 16.31
Potash (60% K2O)	cwt	$ 18.98	1.33	$ 25.24
FUNGICIDES				
CruiserMaxx	oz	$ 4.25	1.6	$ 6.80
Quadris Top SBX	oz	$ 2.75	7	$ 19.25
HERBICIDES				
Boundary	pt	$ 11.20	2	$ 22.40
Gramoxone SL 2.0	oz	$ 0.15	48	$ 7.20
Liberty 280	oz	$ 0.60	29	$ 17.40
Dual Magnum	pt	$ 13.80	1	$ 13.80
INSECTICIDES				
Acephate 90SP	lb	$ 7.43	0.75	$ 5.57
Prevathon	oz	$ 1.32	14	$ 18.48
Bifenthrin	oz	$ 0.78	6.4	$ 4.99
IncidentalPestTrt $8	acre	$ 8.00	1	$ 8.00
SEED/PLANTS				
Soybean Seed LL	lb	$ 1.28	50	$ 64.00
ADJUVANTS				
Surfactant	pt	$ 3.28	0.6	$ 1.97
CUSTOM FERTILIZE				
Custom Apply Fert	acre	$ 7.50	1	$ 7.50
HAULING				
Haul Soybeans	bu	$ 0.27	50	$ 13.50
CUSTOM LIME				
Lime (Spread)	ton	$ 46.00	0.333	$ 15.32
CROP CONSULTANT				
Soybeans Consultant	acre	$ 6.50	1	$ 6.50
INOCULANT				
Optimize	oz	$ 2.14	1.4	$ 3.00
SOIL TEST				
Soil Test	acre	$ 10.00	0.333	$ 3.33
OPERATOR LABOR				
Tractors	hour	$ 13.51	0.1172	$ 1.58
Harvesters	hour	$ 13.51	0.1022	$ 1.38

IRRIGATE LABOR					
Special Labor	hour	$ 9.06	0.0519	$	0.47
HAND LABOR					
Implements	hour	$ 9.06	0.0818	$	0.74
UNALLOCATED LABOR	hour	$ 13.57	0.1886	$	2.56
DIESEL FUEL					
Tractors	gal	$ 1.80	1.3567	$	2.44
Harvesters	gal	$ 1.80	1.3936	$	2.51
1/2-mi Pivot Irr.	gal	$ 1.80	16.4057	$	29.53
Cover Crop					
Cover Crop Seed	acre	$28.00	1	$	28.00
Cover Crop Planting (aerial)	acre	$ 10.00	1	$	10.00
REPAIR & MAINTENANCE					
Implements	acre	$ 3.12	1	$	3.12
Tractors	acre	$ 0.77	1	$	0.77
Harvesters	acre	$ 3.49	1	$	3.49
1/2-mi Pivot Irr.	acre	$ 11.57	1	$	11.57
INTEREST ON OP. CAP.	acre	$ 7.82	1	$	7.82
TOTAL DIRECT EXPENSES				$	406.04
RETURNS ABOVE DIRECT EXPENSES				$	88.96
FIXED EXPENSES					
Implements	acre	$ 5.40	1	$	5.40
Tractors	acre	$ 4.85	1	$	4.85
Harvesters	acre	$ 13.77	1	$	13.77
1/2-mi Pivot Irr.	acre	$ 41.81	1	$	41.81
TOTAL FIXED EXPENSES				$	65.83
TOTAL SPECIFIED EXPENSES				$	471.87
RETURNS ABOVE TOTAL SPECIFIED EXPENSES				$	23.13

Note: Cost of production estimates are based on 2017 input prices.

Estimated costs and returns per acre Soybeans, full-season, RR, stale seedbed, 12R 30" 3-5 Way Cover Crop Mix Aerial Seeded Furrow irrigated, 9 ac-in.

ITEM	UNIT	PRICE	QUANTITY	Total Amount
INCOME				
Soybeans	bu	$ 9.90	60	$ 594.00
TOTAL INCOME				$ 594.00
DIRECT EXPENSES				
CUSTOM SPRAY				
App by Air (10 gal)	appl	$ 8.00	1	$ 8.00
App by Air (5 gal)	appl	$ 6.50	3	$ 19.50
HARVEST AIDS				
Gramoxone SL	oz	$ 0.15	16	$ 2.40
Sodium Chlorate 5L	gal	$ 5.39	0.6	$ 3.23
FERTILIZERS				
Phosphorus(46% P2O5)	cwt	$ 18.75	0.87	$ 16.31
Potash (60% K2O)	cwt	$ 18.98	1.33	$ 25.24
FUNGICIDES				
CruiserMaxx	oz	$ 4.25	1.6	$ 6.80
Quadris Top SBX	oz	$ 2.75	7	$ 19.25
HERBICIDES				
Glyphosate 3lbs a.e	oz	$ 0.14	96	$ 13.44
2,4-D Amine 4	pt	$ 2.40	2	$ 4.80
Select Max	pt	$ 12.64	1	$ 12.64
Valor SX	oz	$ 4.57	2	$ 9.14
Boundary	pt	$ 11.20	2	$ 22.40
Gramoxone SL 2.0	oz	$ 0.15	48	$ 7.20
Prefix	pt	$ 6.53	2	$ 13.06
Zidua	oz	$ 9.05	1.5	$ 13.58
INSECTICIDES				
Acephate 90SP	lb	$ 7.43	0.75	$ 5.57
IRRIGATION SUPPLIES				
Roll-Out Pipe	ft	$ 0.25	33	$ 8.25
SEED/PLANTS				
Soybean Seed RR2	lb	$ 1.51	50	$ 75.50
ADJUVANTS				
Surfactant	pt	$ 3.28	1.1	$ 3.61
CUSTOM FERTILIZE				
Custom Apply Fert	acre	$ 7.50	1	$ 7.50
HAULING				
Haul Soybeans	bu	$ 0.27	60	$ 16.20
CUSTOM LIME				
Lime (Spread)	ton	$ 46.00	0.333	$ 15.32
CROP CONSULTANT				
Soybeans Consultant	acre	$ 6.50	1	$ 6.50
INOCULANT				

Optimize	oz	$ 2.14	1.4	$	3.00
SOIL TEST					
Soil Test	acre	$ 10.00	0.333	$	3.33
OPERATOR LABOR					
Tractors	hour	$ 13.51	0.4713	$	6.37
Harvesters	hour	$ 13.51	0.1022	$	1.38
IRRIGATE LABOR					
Special Labor	hour	$ 9.06	0.3	$	2.72
Implements	hour	$ 9.06	0.0625	$	0.57
HAND LABOR					
Implements	hour	$ 9.06	0.0959	$	0.87
UNALLOCATED LABOR	hour	$ 13.51	0.4455	$	6.02
DIESEL FUEL					
Tractors	gal	$ 1.80	5.2753	$	9.50
Harvesters	gal	$ 1.80	1.3936	$	2.51
Roll-Out Pipe Irr.	gal	$ 1.80	7.3317	$	13.20
Cover Crop					
Cover Crop Seed	acre	$28.00	1	$	28.00
Cover Crop Planting (aerial)	acre	$ 10.00	1	$	10.00
REPAIR & MAINTENANCE					
Implements	acre	$ 5.47	1	$	5.47
Tractors	acre	$ 2.98	1	$	2.98
Harvesters	acre	$ 3.49	1	$	3.49
Roll-Out Pipe Irr.	acre	$ 6.89	1	$	6.89
INTEREST ON OP. CAP.	acre	$ 10.15	1	$	10.15
TOTAL DIRECT EXPENSES				$	443.89
RETURNS ABOVE DIRECT EXPENSES				$	150.11
FIXED EXPENSES					
Implements	acre	$ 11.96	1	$	11.96
Tractors	acre	$ 18.75	1	$	18.75
Harvesters	acre	$ 13.77	1	$	13.77
Roll-Out Pipe Irr.	acre	$ 53.42	1	$	53.42
TOTAL FIXED EXPENSES				$	97.90
TOTAL SPECIFIED EXPENSES				$	541.79
RETURNS ABOVE TOTAL SPECIFIED EXPENSES				$	52.21

Note: Cost of production estimates are based on 2017 input prices.

Estimated costs and returns per acre Soybeans, full-season, RR, stale seedbed, 12R 30"
3-5 Way Cover Crop Mix Aerial Seeded Non-irrigated

ITEM	UNIT	PRICE	QUANTITY	Total Amount
INCOME				
Soybeans	bu	$ 9.90	42	$ 415.80
TOTAL INCOME				$ 415.80
DIRECT EXPENSES				
CUSTOM SPRAY				
App by Air (10 gal)	appl	$ 8.00	1	$ 8.00
App by Air (5 gal)	appl	$ 6.50	2	$ 13.00
HARVEST AIDS				
Gramoxone SL	oz	$ 0.15	16	$ 2.40
Sodium Chlorate 5L	gal	$ 5.39	0.6	$ 3.23
FERTILIZERS				
Phosphorus(46% P2O5)	cwt	$ 18.75	0.87	$ 16.31
Potash (60% K2O)	cwt	$ 18.98	1.33	$ 25.24
FUNGICIDES				
CruiserMaxx	oz	$ 4.25	1.6	$ 6.80
HERBICIDES				
Glyphosate 3lbs a.e	oz	$ 0.14	96	$ 13.44
2,4-D Amine 4	pt	$ 2.40	2	$ 4.80
Select Max	pt	$ 12.64	1	$ 12.64
Valor SX	oz	$ 4.57	2	$ 9.14
Boundary	pt	$ 11.20	2	$ 22.40
Gramoxone SL 2.0	oz	$ 0.15	48	$ 7.20
Prefix	pt	$ 6.53	2	$ 13.06
Zidua	oz	$ 9.05	1.5	$ 13.58
INSECTICIDES				
Acephate 90SP	lb	$ 7.43	0.75	$ 5.57
SEED/PLANTS				
Soybean Seed RR2	lb	$ 1.51	50	$ 75.50
ADJUVANTS				
Surfactant	pt	$ 3.28	1	$ 3.28
CUSTOM FERTILIZE				
Custom Apply Fert	acre	$ 7.50	1	$ 7.50
HAULING				
Haul Soybeans	bu	$ 0.27	42	$ 11.34
CUSTOM LIME				
Lime (Spread)	ton	$ 46.00	0.333	$ 15.32
CROP CONSULTANT				

Soybeans Consultant	acre	$ 6.50	1	$	6.50
INOCULANT					
Optimize	oz	$ 2.14	1.4	$	3.00
SOIL TEST					
Soil Test	acre	$ 10.00	0.333	$	3.33
OPERATOR LABOR					
Tractors	hour	$ 13.51	0.3303	$	4.46
Harvesters	hour	$ 13.51	0.1022	$	1.38
HAND LABOR					
Implements	hour	$ 9.06	0.0959	$	0.87
UNALLOCATED LABOR	hour	$ 13.51	0.3892	$	5.26
DIESEL FUEL					
Tractors	gal	$ 1.80	3.8253	$	6.89
Harvesters	gal	$ 1.80	1.3936	$	2.51
Cover Crop					
Cover Crop Seed	acre	$28.00	1	$	28.00
Cover Crop Planting (aerial)	acre	$ 10.00	1	$	10.00
REPAIR & MAINTENANCE					
Implements	acre	$ 4.81	1	$	4.81
Tractors	acre	$ 2.18	1	$	2.18
Harvesters	acre	$ 3.49	1	$	3.49
INTEREST ON OP. CAP.	acre	$ 9.09	1	$	9.09
TOTAL DIRECT EXPENSES				$	373.52
RETURNS ABOVE DIRECT EXPENSES				$	42.28
FIXED EXPENSES					
Implements	acre	$ 9.73	1	$	9.73
Tractors	acre	$ 13.66	1	$	13.66
Harvesters	acre	$ 13.77	1	$	13.77
TOTAL FIXED EXPENSES				$	37.16
TOTAL SPECIFIED EXPENSES				$	410.68
RETURNS ABOVE TOTAL SPECIFIED EXPENSES				$	5.12

Note: Cost of production estimates are based on 2017 input prices.

The mention in this report of any commercial product does not imply its endorsement by MSU-ES, USDA over other products not named nor does the omission imply they are not satisfactory.

Estimated costs and returns per acre Soybeans, double crop after wheat, RR, 12R 30" 3-5 Way Cover Crop Mix Aerial Seeded Pivot irrigated, 7.5 ac-in.

ITEM	UNIT	PRICE	QUANTITY	Total Amount
INCOME				
Soybeans	bu	$ 9.90	50	$ 495.00
TOTAL INCOME				$ 495.00
DIRECT EXPENSES				
CUSTOM SPRAY				
App by Air (10 gal)	appl	$ 8.00	1	$ 8.00
App by Air (5 gal)	appl	$ 6.50	3	$ 19.50
FERTILIZERS				
Phosphorus(46% P2O5)	cwt	$ 18.75	0.87	$ 16.31
Potash (60% K2O)	cwt	$ 18.98	1.33	$ 25.24
FUNGICIDES				
CruiserMaxx	oz	$ 4.25	1.6	$ 6.80
Quadris Top SBX	oz	$ 2.75	7	$ 19.25
HERBICIDES				
Boundary	pt	$ 11.20	2	$ 22.40
Gramoxone SL 2.0	oz	$ 0.15	48	$ 7.20
Glyphosate 3lbs a.e	oz	$ 0.14	32	$ 4.48
Prefix	pt	$ 6.53	2	$ 13.06
INSECTICIDES				
Acephate 90SP	lb	$ 7.43	0.75	$ 5.57
Prevathon	oz	$ 1.32	14	$ 18.48
Bifenthrin	oz	$ 0.78	6.4	$ 4.99
IncidentalPestTrt $8	acre	$ 8.00	1	$ 8.00
SEED/PLANTS				
Soybean Seed RR2	lb	$ 1.51	50	$ 75.50
ADJUVANTS				
Surfactant	pt	$ 3.28	0.6	$ 1.97
CUSTOM FERTILIZE				
Custom Apply Fert	acre	$ 7.50	1	$ 7.50
HAULING				
Haul Soybeans	bu	$ 0.27	50	$ 13.50
CUSTOM LIME				
Lime (Spread)	ton	$ 46.00	0.333	$ 15.32
CROP CONSULTANT				
Soybeans Consultant	acre	$ 6.50	1	$ 6.50
INOCULANT				
Optimize	oz	$ 2.14	1.4	$ 3.00
SOIL TEST				
Soil Test	acre	$ 10.00	0.333	$ 3.33
OPERATOR LABOR				
Tractors	hour	$ 13.51	0.1172	$ 1.58
Harvesters	hour	$ 13.51	0.1022	$ 1.38

IRRIGATE LABOR					
Special Labor	hour	$ 9.06	0.0519	$	0.47
HAND LABOR					
Implements	hour	$ 9.06	0.0818	$	0.74
UNALLOCATED LABOR	hour	$ 13.57	0.1886	$	2.56
DIESEL FUEL					
Tractors	gal	$ 1.80	1.3567	$	2.44
Harvesters	gal	$ 1.80	1.3936	$	2.51
1/2-mi Pivot Irr.	gal	$ 1.80	16.4057	$	29.53
Cover Crop					
Cover Crop Seed	acre	$28.00	1	$	28.00
Cover Crop Planting (aerial)	acre	$ 10.00	1	$	10.00
REPAIR & MAINTENANCE					
Implements	acre	$ 3.12	1	$	3.12
Tractors	acre	$ 0.77	1	$	0.77
Harvesters	acre	$ 3.49	1	$	3.49
1/2-mi Pivot Irr.	acre	$ 11.57	1	$	11.57
INTEREST ON OP. CAP.	acre	$ 7.82	1	$	7.82
TOTAL DIRECT EXPENSES				$	403.88
RETURNS ABOVE DIRECT EXPENSES				$	91.12
FIXED EXPENSES					
Implements	acre	$ 5.40	1	$	5.40
Tractors	acre	$ 4.85	1	$	4.85
Harvesters	acre	$ 13.77	1	$	13.77
1/2-mi Pivot Irr.	acre	$ 41.81	1	$	41.81
TOTAL FIXED EXPENSES				$	65.83
TOTAL SPECIFIED EXPENSES				$	469.71
RETURNS ABOVE TOTAL SPECIFIED EXPENSES				$	25.29

Note: Cost of production estimates are based on 2017 input prices.

Estimated costs and returns per acre Soybeans, full-season, RR2X, stale seedbed, 12R 30" 3-5 Way Cover Crop Mix Aerial Seeded Furrow irrigated, 9 ac-in.

ITEM	UNIT	PRICE	QUANTITY	Total Amount
INCOME				
Soybeans	bu	$ 9.90	60	$ 594.00
TOTAL INCOME				$ 594.00
DIRECT EXPENSES				
CUSTOM SPRAY				
App by Air (10 gal)	appl	$ 8.00	1	$ 8.00
App by Air (5 gal)	appl	$ 6.50	3	$ 19.50
HARVEST AIDS				
Gramoxone SL	oz	$ 0.15	16	$ 2.40
Sodium Chlorate 5L	gal	$ 5.39	0.6	$ 3.23
FERTILIZERS				
Phosphorus(46% P2O5)	cwt	$ 18.75	0.87	$ 16.31
Potash (60% K2O)	cwt	$ 18.98	1.33	$ 25.24
FUNGICIDES				
CruiserMaxx	oz	$ 4.25	1.6	$ 6.80
Quadris Top SBX	oz	$ 2.75	7	$ 19.25
HERBICIDES				
Glyphosate 3lbs a.e	oz	$ 0.14	96	$ 13.44
2,4-D Amine 4	pt	$ 2.40	2	$ 4.80
Select Max	pt	$ 12.64	1	$ 12.64
Valor SX	oz	$ 4.57	2	$ 9.14
Boundary	pt	$ 11.20	2	$ 22.40
Gramoxone SL 2.0	oz	$ 0.15	48	$ 7.20
Prefix	pt	$ 6.53	2	$ 13.06
Zidua	oz	$ 9.05	1.5	$ 13.58
INSECTICIDES				
Acephate 90SP	lb	$ 7.43	0.75	$ 5.57
IRRIGATION SUPPLIES				
Roll-Out Pipe	ft	$ 0.25	33	$ 8.25
SEED/PLANTS				
Soybean Seed RR2X	lb	$ 1.47	50	$ 73.50
ADJUVANTS				
Surfactant	pt	$ 3.28	1.1	$ 3.61
CUSTOM FERTILIZE				
Custom Apply Fert	acre	$ 7.50	1	$ 7.50
HAULING				
Haul Soybeans	bu	$ 0.27	60	$ 16.20
CUSTOM LIME				
Lime (Spread)	ton	$ 46.00	0.333	$ 15.32
CROP CONSULTANT				
Soybeans Consultant	acre	$ 6.50	1	$ 6.50
INOCULANT				

Optimize	oz	$ 2.14	1.4	$	3.00
SOIL TEST					
Soil Test	acre	$ 10.00	0.333	$	3.33
OPERATOR LABOR					
Tractors	hour	$ 13.51	0.4713	$	6.37
Harvesters	hour	$ 13.51	0.1022	$	1.38
IRRIGATE LABOR					
Special Labor	hour	$ 9.06	0.3	$	2.72
Implements	hour	$ 9.06	0.0625	$	0.57
HAND LABOR					
Implements	hour	$ 9.06	0.0959	$	0.87
UNALLOCATED LABOR	hour	$ 13.51	0.4455	$	6.02
DIESEL FUEL					
Tractors	gal	$ 1.80	5.2753	$	9.50
Harvesters	gal	$ 1.80	1.3936	$	2.51
Roll-Out Pipe Irr.	gal	$ 1.80	7.3317	$	13.20
Cover Crop					
Cover Crop Seed	acre	$28.00	1	$	28.00
Cover Crop Planting (aerial)	acre	$ 10.00	1	$	10.00
REPAIR & MAINTENANCE					
Implements	acre	$ 5.47	1	$	5.47
Tractors	acre	$ 2.98	1	$	2.98
Harvesters	acre	$ 3.49	1	$	3.49
Roll-Out Pipe Irr.	acre	$ 6.89	1	$	6.89
INTEREST ON OP. CAP.	acre	$ 10.11	1	$	10.11
TOTAL DIRECT EXPENSES				$	441.85
RETURNS ABOVE DIRECT EXPENSES				$	152.15
FIXED EXPENSES					
Implements	acre	$ 11.96	1	$	11.96
Tractors	acre	$ 18.75	1	$	18.75
Harvesters	acre	$ 13.77	1	$	13.77
Roll-Out Pipe Irr.	acre	$ 53.42	1	$	53.42
TOTAL FIXED EXPENSES				$	97.90
TOTAL SPECIFIED EXPENSES				$	539.75
RETURNS ABOVE TOTAL SPECIFIED EXPENSES				$	54.25

Note: Cost of production estimates are based on 2017 input prices.

Estimated costs and returns per acre Soybeans, full-season, RR2X, stale seedbed, 12R 30" 3-5 Way Cover Crop Mix Aerial Seeded Non-irrigated

ITEM	UNIT	PRICE	QUANTITY	Total Amount
INCOME				
Soybeans	bu	$ 9.90	42	$ 415.80
TOTAL INCOME				$ 415.80
DIRECT EXPENSES				
CUSTOM SPRAY				
App by Air (10 gal)	appl	$ 8.00	1	$ 8.00
App by Air (5 gal)	appl	$ 6.50	2	$ 13.00
HARVEST AIDS				
Gramoxone SL	oz	$ 0.15	16	$ 2.40
Sodium Chlorate 5L	gal	$ 5.39	0.6	$ 3.23
FERTILIZERS				
Phosphorus(46% P2O5)	cwt	$ 18.75	0.87	$ 16.31
Potash (60% K2O)	cwt	$ 18.98	1.33	$ 25.24
FUNGICIDES				
CruiserMaxx	oz	$ 4.25	1.6	$ 6.80
HERBICIDES				
Glyphosate 3lbs a.e	oz	$ 0.14	96	$ 13.44
2,4-D Amine 4	pt	$ 2.40	2	$ 4.80
Select Max	pt	$ 12.64	1	$ 12.64
Valor SX	oz	$ 4.57	2	$ 9.14
Boundary	pt	$ 11.20	2	$ 22.40
Gramoxone SL 2.0	oz	$ 0.15	48	$ 7.20
Prefix	pt	$ 6.53	2	$ 13.06
Zidua	oz	$ 9.05	1.5	$ 13.58
INSECTICIDES				
Acephate 90SP	lb	$ 7.43	0.75	$ 5.57
SEED/PLANTS				
Soybean Seed RR2X	lb	$ 1.47	50	$ 73.50
ADJUVANTS				
Surfactant	pt	$ 3.28	1	$ 3.28
CUSTOM FERTILIZE				
Custom Apply Fert	acre	$ 7.50	1	$ 7.50
HAULING				
Haul Soybeans	bu	$ 0.27	42	$ 11.34
CUSTOM LIME				
Lime (Spread)	ton	$ 46.00	0.333	$ 15.32
CROP CONSULTANT				
Soybeans Consultant	acre	$ 6.50	1	$ 6.50
INOCULANT				
Optimize	oz	$ 2.14	1.4	$ 3.00
SOIL TEST				
Soil Test	acre	$ 10.00	0.333	$ 3.33

OPERATOR LABOR					
Tractors	hour	$ 13.51	0.3303	$	4.46
Harvesters	hour	$ 13.51	0.1022	$	1.38
HAND LABOR					
Implements	hour	$ 9.06	0.0959	$	0.87
UNALLOCATED LABOR	hour	$ 13.51	0.3892	$	5.26
DIESEL FUEL					
Tractors	gal	$ 1.80	3.8253	$	6.89
Harvesters	gal	$ 1.80	1.3936	$	2.51
Cover Crop					
Cover Crop Seed	acre	$28.00	1	$	28.00
Cover Crop Planting (aerial)	acre	$ 10.00	1	$	10.00
REPAIR & MAINTENANCE					
Implements	acre	$ 4.81	1	$	4.81
Tractors	acre	$ 2.18	1	$	2.18
Harvesters	acre	$ 3.49	1	$	3.49
INTEREST ON OP. CAP.	acre	$ 9.05	1	$	9.05
TOTAL DIRECT EXPENSES				$	371.48
RETURNS ABOVE DIRECT EXPENSES				$	44.32
FIXED EXPENSES					
Implements	acre	$ 9.73	1	$	9.73
Tractors	acre	$ 13.66	1	$	13.66
Harvesters	acre	$ 13.77	1	$	13.77
TOTAL FIXED EXPENSES				$	37.16
TOTAL SPECIFIED EXPENSES				$	408.64
RETURNS ABOVE TOTAL SPECIFIED EXPENSES				$	7.16

Note: Cost of production estimates are based on 2017 input prices.

Estimated costs and returns per acre Soybeans, double crop after wheat, RR2X, 12R 30" 3-5 Way Cover Crop Mix Aerial Seeded Pivot irrigated, 7.5 ac-in.

ITEM	UNIT	PRICE	QUANTITY	Total Amount
INCOME				
Soybeans	bu	$ 9.90	50	$ 495.00
TOTAL INCOME				$ 495.00
DIRECT EXPENSES				
CUSTOM SPRAY				
App by Air (10 gal)	appl	$ 8.00	1	$ 8.00
App by Air (5 gal)	appl	$ 6.50	3	$ 19.50
FERTILIZERS				
Phosphorus(46% P2O5)	cwt	$ 18.75	0.87	$ 16.31
Potash (60% K2O)	cwt	$ 18.98	1.33	$ 25.24
FUNGICIDES				
CruiserMaxx	oz	$ 4.25	1.6	$ 6.80
Quadris Top SBX	oz	$ 2.75	7	$ 19.25
HERBICIDES				
Boundary	pt	$ 11.20	2	$ 22.40
Gramoxone SL 2.0	oz	$ 0.15	48	$ 7.20
Glyphosate 3lbs a.e	oz	$ 0.14	32	$ 4.48
Prefix	pt	$ 6.53	2	$ 13.06
INSECTICIDES				
Acephate 90SP	lb	$ 7.43	0.75	$ 5.57
Prevathon	oz	$ 1.32	14	$ 18.48
Bifenthrin	oz	$ 0.78	6.4	$ 4.99
IncidentalPestTrt $8	acre	$ 8.00	1	$ 8.00
SEED/PLANTS				
Soybean Seed RR2X	lb	$ 1.47	50	$ 73.50
ADJUVANTS				
Surfactant	pt	$ 3.28	0.6	$ 1.97
CUSTOM FERTILIZE				
Custom Apply Fert	acre	$ 7.50	1	$ 7.50
HAULING				
Haul Soybeans	bu	$ 0.27	50	$ 13.50
CUSTOM LIME				
Lime (Spread)	ton	$ 46.00	0.333	$ 15.32
CROP CONSULTANT				
Soybeans Consultant	acre	$ 6.50	1	$ 6.50
INOCULANT				
Optimize	oz	$ 2.14	1.4	$ 3.00
SOIL TEST				
Soil Test	acre	$ 10.00	0.333	$ 3.33
OPERATOR LABOR				
Tractors	hour	$ 13.51	0.1172	$ 1.58
Harvesters	hour	$ 13.51	0.1022	$ 1.38

IRRIGATE LABOR					
Special Labor	hour	$ 9.06	0.0519	$	0.47
HAND LABOR					
Implements	hour	$ 9.06	0.0818	$	0.74
UNALLOCATED LABOR	hour	$ 13.57	0.1886	$	2.56
DIESEL FUEL					
Tractors	gal	$ 1.80	1.3567	$	2.44
Harvesters	gal	$ 1.80	1.3936	$	2.51
1/2-mi Pivot Irr.	gal	$ 1.80	16.4057	$	29.53
Cover Crop					
Cover Crop Seed	acre	$28.00	1	$	28.00
Cover Crop Planting (aerial)	acre	$ 10.00	1	$	10.00
REPAIR & MAINTENANCE					
Implements	acre	$ 3.12	1	$	3.12
Tractors	acre	$ 0.77	1	$	0.77
Harvesters	acre	$ 3.49	1	$	3.49
1/2-mi Pivot Irr.	acre	$ 11.57	1	$	11.57
INTEREST ON OP. CAP.	acre	$ 7.78	1	$	7.78
TOTAL DIRECT EXPENSES				$	401.84
RETURNS ABOVE DIRECT EXPENSES				$	93.16
FIXED EXPENSES					
Implements	acre	$ 5.40	1	$	5.40
Tractors	acre	$ 4.85	1	$	4.85
Harvesters	acre	$ 13.77	1	$	13.77
1/2-mi Pivot Irr.	acre	$ 41.81	1	$	41.81
TOTAL FIXED EXPENSES				$	65.83
TOTAL SPECIFIED EXPENSES				$	467.67
RETURNS ABOVE TOTAL SPECIFIED EXPENSES				$	27.33

Note: Cost of production estimates are based on 2017 input prices.

Attachment C Farm Cooperators

Primary Farm Cooperators

Prewitt Farms PO Box 517
Boyle, MS 38730

Nelson-King Farms PO Box 207
Chatham, MS 38731

Carter Plantation Ltd.
PO Box 458
Rolling Fork, MS 39159

Omega Planting Company PO Box 38
Tunica, MS 38676

Mosco Farms Partnership 488 Laughlin Rd.
Cleveland, MS 38732

Norway Farms II 635 Coker Rd
Yazoo City, MS 39194

Cypress Brake Planting 19383 River Rd
Yazoo City, MS 39194

Simmons Planting Company 2491 Hwy 438
Arcola, MS 38722

Belmont Planting Co 4146 Stovall Rd
Clarksdale, MS 38614

Cypress Brake Planting Company PO Box 1052
Tunica, MS 38676

Big River Farms
460 Davenport Allen Rd Clarksdale, MS 38614

TKT Farms
836 Fairview Rd
Shaw, MS 38773

Attachment D Articles

Why Cover Crops?

The 2014 cover crop trials revealed several factors that influenced grower's decision to utilize cover crops in their production system.

- Reducing erosion
- Reducing compaction
- Increasing organic matter
- Weed suppression
- Improving soil structure

Wind and water erosion is commonplace on Delta agricultural lands subject to normal tillage practices. While the loss of sediment and nutrients may not be readily apparent on the field, it is very evident in ditches, streams, and lakes throughout the Delta. Although, the true cost of erosion is difficult to quantify, there comes a point when the cost is realized through the observation of its negative impacts to both soil and water resources.

Wind erosion. *Photo by Rachel Stout Evans.*

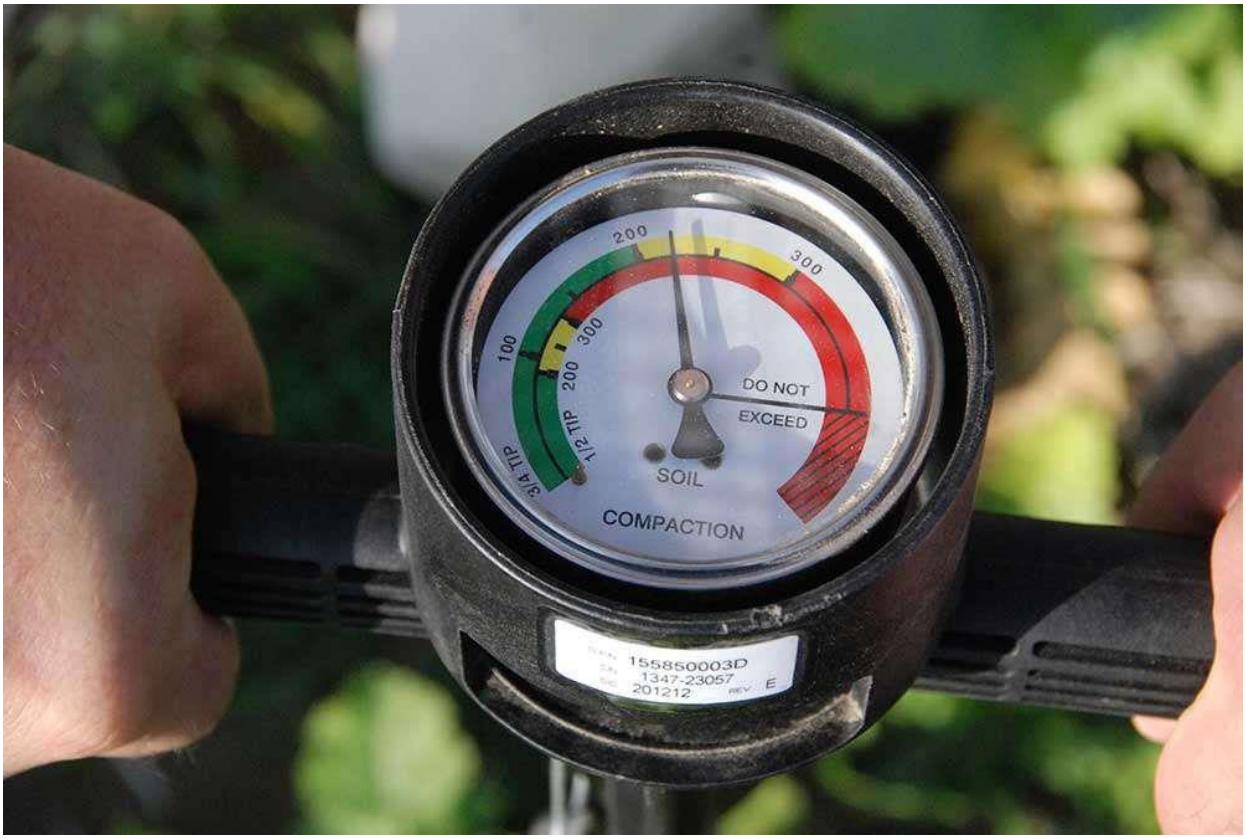
Field erosion. *Photo by Rachel Stout Evans.*

Field erosion. *Photo by Rachel Stout Evans.*

Compaction issues due to both traffic and tillage were readily observed on fields around the Delta in 2014. The initial cause for investigation in many instances was poor irrigation water infiltration which was observed through the use of soil moisture sensors. These suspicions were confirmed through the use of penetrometers to measure compaction in pounds per square inch and by simply digging to and through the compacted zone with a shovel. Low organic matter and poor soil structure are directly related to compaction and poor infiltration issues.

The compacted layer in this conventionally tilled field clearly begins at 4.5 inches.

Roots also are an indicator of compaction. The tillage radish tuber pictured here diverged from its vertical path downward in search of a path of less resistance around and through the compacted zones. *Photos by Rachel Stout Evans*.



A penetrometer is an excellent method of finding and measuring compaction zones that may be restricting root growth and water infiltration. *Photo by Rachel Stout Evans.*

Earth

Bern Prewitt Jr. is utilizing an initiave that will hopefully keep his soil full of nutrients

Prewitt joins soil initiative

BY AIMEE ROBINETTE
&la,7118Gean:JD.mn

If there is one visual consistently seenin theMississippi Delta it is soil. While some may consider it just dirt, the impact soil has on farmland is immeasurable. One may think com, wheat, soybeans or rice are a farmer's most beneficial resources. According to Dan Prevost, project manager with Delta Farmers Advocating Resource Management, soil is their most valuable asset

It is because of the soil that Bern Prewitt Jr. joined the Missis.<nppi Soil Health Initiative, a program which began this past September. Led by Delta F.AR.M. in partnership with the Natu-r.u Resource Conservation Service, the purpose of the initiative is to helpgrowers

be more profitable and sustainable by improving the health of their most valuable asset, the soil.

"Management systems and practices used to build heal.thy soils also produce many environmental benfits such as reducing sediment and nutrient los.5, reducing irrigation water demand through improved infiltration and holding capacity, and sequestering more carbon from the atmosphere," said Prevost.

"The purpose of this initiative is to help farmers across the U.S. to transition to agricultural management

PREWITT cont., **PAGE Al**

PREWITT

Continued from ***Page A2***

systems and practices that focus on rebuilding the soil to pJO(luce more profitable crops. There are several key concepts to building healthy soil that apply universally, regardless of climate, terrain and crops.

"These principals include: keep the soil covered as much as possible; disturbing the soil as little as possible; keeping plants growing throughout the year; diversifying plant growth using crop rotation and cover crops; and maintain adequate and balanced soil nutrients," he explained.

One of the main reasons the Prewitts are trying cover crops is to reduce compaction in the silt loam soils like they have around Jones Bayou.

"This past spring we observed a highly-compacted layer approximately eight-10 inches below the soil surface in several of the Pr.e-witts' fields, particularly aroundJonesBayou.These compacted layers can restrict root development, which can reduce the potential for water and nutrient uptake deeperin the soil profile," said Prevost "We anticipate use of these cover crops in cor\junction with reduced tillage will help alleviate the compacted layer over time, thereby improving productivity and yield"

Cover crops are planted and grown in between cash crops when the ground is normally fallow. They can beusedto help reduce compaction and break-up hardpans, build soil organic matter, suppress weed growth, reduce fall applied fertilizer loss, and improve internal soil drainage.

"The first step intheMississippi Soil HealthInitiative was to conduct Cover Crop 1iials throughout the Mississippi Delta to determine which specific cover crops and planting/management methods work best in our region. The Cover Crop Trials are being conducted with support from NRCS, Mississippi Department of Environmental Quality, Jimmy Sanders, Pinnacle Ag, and Cover Crop Solutions," he added "Currently there are approximately 6,200 acres of cover crops planted throughout the Delta for trials and demonstrations. We have 27 farmers that are participating in the program.

"The Prewitts are partioipants in this program. One of the primaey cover crop mixes the Prewitts utilized contains '11llage Radisllt 1iit,. icale, and Crimson Clover, known as the Charlotte Mix," he noted.

Prewitt said it has stopped erosion and dust, which is what he was looking for on his land. However, what it will do later in terms of planting actual crops is still an unlmown variable.

"We just don't know yet. We have to be able to plant thrQugh it and get a crop out," he explained "The other issue is itis supposed to help the soil hold nutrients; we don't know that yet, either.

"We are trying to be proactive," he said. "We want our soil to be healthy. We are trying tobuild up om soil, so that is whatremains to be seen. We won't know until later on if this initiative was successful for us or not. We don't know if this is the answer, but we were willing to see what itnpacts it will have, if any*n*.

QUOTE OF THE WEEK

"Man cannotdiscovernew oceansunless hehasthe courage trJ losesightof the shore"

-AndreGide

The Cleveland Current

FARMING

D1

Bolivar County's weekly source for outdoor news.

Special to The Cleveland Current

FOR MILES AND MILES: Cropland around the county will soon look like this as the winter approaches.

Crop cover

farmers using more crops for land benefits

BY MARK H. STOWERS
TheCleveland Curren/

Cropcover, or crops planted over the winter to help protect Delta soil, have been in usefor quite some time. But the past couple of years the F.AR.M. (Fanners Advocating Resource Management) group in Stoneville implemented a program to encourage more fanners to take advantage of cover crops.

Trey Cooke, executive director, who leads the office staff of fourfull-time and one part-time employee's noted that F.AR.M has been "implementing a HealthySoilInitiative and hasbeen working with a number of fanners to demonstrate the effectiveness and benefits of cover crops in the Delta. We are underwriting the cost of materials (seed) for some ofour project cooperators, butour funding is limited."

Dan Prevost is the Field Conservationist and Project Manager for Delta FARM. and helped eXPlain more about the beneficial program.

"The objective is to improve soil quality and improvesoil health," Prevostsaid. "In tum,itimpro'l:es w r resourcesand adclresses waterquality and quantity concenlS."

By planting cover crops that include radishes and wheat that is flown in via cropduster, there is reduced soil compaction, reduced sediment and nutrient loss and reduced irrigation through improved filtration and holdingcapacity.

"Our objectiveis to workwith as many fanners as possible with planting cover cropsso wecanreally figureout the practical applications," he said. "What is the best method of planting? What are the best varieties to plant?When do you need to plant them? When do you need toterminate them?"

There is not a lot of researchcurrently, but P,revostis workingto securethatdata from fanners through the program in order to help as many fanners as possible across the Delta.

"Last year I had about 24 fanners that I workedwith, and we provided 100 acres of seeds if they would agree to plant it and manage it. They had to pay for the herbicide and applications to kill it. That helps offset the risks, and we learn together," he said.

The idea is to disturb the soil as little as possible, and the residue is left on top of the ground.

"That does a couple of things. First, it suppresses weed growth. I've got a couple of farmers that use it to battle pig weed. Secondly, it puts more organic matter back in the soil It canslow the rate of water runoff, and the cover crop roots-:;- whenth,e qop dies the roots become pathways for water to enter the soil. Wetalked about irrigation efficiency or improving the drainage of soil," he said. "They do a really good job of scavenging nutrients. If you have residual nitrogen from a corn crop, the covercrops doagoodjob ofholding thatnitrogenand

FARM LAND *continued,* **PAGE 02**

FARM LAND

Continued from Page D 1

keeping it from running off **dtuing the winter."**

The nutrients don't run off, which keeps them outof local streams and rivers and the Gulf of Mexico. Currently, Prevost· has more than 24 fanuers spread out over the Delta in the program.

"This is the second year of the program. We ;ixe funited on funds, so I can only have about 25farmers or so. The farmers we are working with, we are figuring out how to manage the cover crops, and we are documenting all of the work with Miss State," he said. "At the end of the day, it has to be a financially feasible and beneficial option."

Overall, there had been more interest but with the abnormally dry weather the program is behind a bit, as the crops are normally planted in September and Octobe1:

"The big picture is more tl1anjust putting out a cover crop. It's about soil management and how we better manage our soils to benefit the environment and also the economics as well."

The idea of cover crops has been around for awhile.

"They are not new. If you tall< to old-tinle farmers, back in the 80s they put down cover crops in the winter, and in the spring - when it was turned under in the spring - it was some of the best ground you've ever seen in your life," he said. "But witi1 earlier planting dates and the lack of the proper herbicides, that practice went to the wayside."

To learn more about the program, check out www.mscovercrop.com.

Mississippi producer B.Jones checks one of his relatively weed-free Holmes County, Miss., peanut fields.

B. Jones: Mississippi grower maximizes benefits of cover crops

By Doreen Muzzi
Contributing Writer

One Mississippi producer may have found a way to rid his farm of pigweed, that prickly, fast-growing, troublesome weed dotting the Delta's landscape. The solution, according Mississippi producer B. Jones, lies in a winter mix of beneficial vegetation.

When Delta F.A.R.M. (Farmers Advocating Resource Management) kicked off the Mississippi Healthy Soils Initiative in the fall of 2014 with the aim of demonstrating and evaluating better ways to build healthy soils, B. Jones and his brother, Will, were already believers in the benefits of a winter cover crop. What they didn't know then, was how much pigweed control that cover crop would offer.

TheJones brothers, who farm in Mississippi's Holmes and Humphreys counties, began planting winter cover crops a few years ago, both for the soil benefits and for the promise of better weed control. Their initial crop mix was a seed blend out of west Tennessee that included clover, cereal rye and tillage radishes. While the clover provides a residual nitrogen benefit, especially for a spring corn crop, the tillage radishes aid in soil aeration and the cereal rye assists with weed control.

According to University of Arkansas researcher Trenton Roberts, "As far as cover crops go in the Mid-South region, cereal rye is a workhorse that is hard to beat in terms of the benefits that can be gained for the relatively low input cost that is required to establish and manage it as a cover crop:'

The conservation practice impressed the Jones brothers enough to continue planting cover crops, with a few creative adjustments of their own. Beginning in 2013, Jones created their own cover crop blends to best fit the needs of each field.

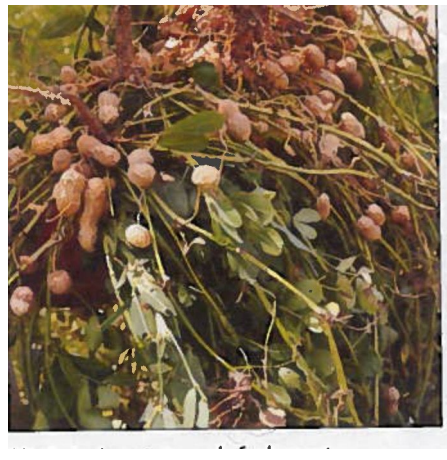
DROPPED CLOVER RATE

In 2014, on all freshly leveled land, or land with hardpan soils, B. Jones made the decision to drop the clover rate in his cover crop mix.• 1 wanted as much rye as I could get in my budget to help with the weeds. Our goal was to control pigweed and break up that hardpan. The cereal *rye* seems to really help with weed control. Even when it is dead, it keeps the light out, which helps control pigweed," Jones says.

"In most cases the name of the game for cover crop success is biomass production;' says Roberts. "Cover crop biomass production is essential to achieve many of the benefits that are associated with cover crop use including erosion reduction, weed suppression, nutrient retention, crusting prevention and increasing soil organic matter. Cereal rye is a huge biomass producer with little to no input cost.•

While sticking to a $35-per-acre budget, Jones also tripled the rate of tillage radishes in his cover crop mix to break up the hardpan soils. While Jones didn't have what he considers "the best• stand of radishes, he says the cover crop was a worthy investment. "The amazing thing is where I've put it, the pigweed population is greatly diminished; he says.

This year, Jones will again alter his cover crop planting ratios according to the needs of each field.Because he didn't land-level any fields in 2015, he will cut back on the percentage of tillage radishes he plants. He's targeting weed control in peanuts with an increase in the percentage of cereal rye planted, and will add in some winter wheat or oats for the additional ground cover benefits those two crops may provide in terms of weed control.



Mississippi peanuts ready for harvest.

Jones plants the cover crops into sandy and sandy loam soils that will be seeded for soybeans, peanuts, cotton, and corn next spring. While most crop fields are planted from turnrow to turnrow, the cover crop on Jones' peanut fields is planted along the edges of the fields where pigweed pressure and hog and deer populations are high.

He aims for an early September planting date, but weather and harvest timing often alter that date."The first of September is the ideal time to plant cover crops because it gives the tillage radishes adequate time to grow to maturity," Jones says. "Much of our crop is still in the ground the first of September, however, so we are aiming for a cover crop planting window of Sept. 1 to Oct. 1. It's a real timing issue.•

MOST BROADCAST

Most of Jones' cover crop is broadcast onto the soil's surface, but he may drill some seed into the soil additional time presents itself. He also has planted the cover crop on beds in 30-inch rows, and he has planted them flat in soybean fields before pulling the middles for irrigation."The rye is plentiful down in those middles where the weed pressure is highest;he says.

Jones adds, "The weed control the cover crop has provided in all three crops (peanuts, soybeans and corn) has been amazing, especially with regards to pigweed. The rye appears to greatly suppress our pigweed pressure.•

Despite the fact the majority of tillage radishes die from winterkill, Jones does terminate the cover crop with a herbicide burndown. Fields that will be planted to corn are terminated one month prior to planting, and both soybean and peanut fields are terminated six weeks prior to planting.

"I am still experimenting with this cover crop system, but so far I've been very impressed with the weed control benefits the system provides,• Jones says.

Since Delta F.A.R.M. kicked off the **Mississippi Healthy Soils** Initiative in the fall of 2014, more than 8,500 acres of cover crops are being planted by 30 farmers on more than 120 fields in Mississippi.

An association of growers and landowners, Delta F.A.R.M. (Farmers Advocating Resource Management) strives to implement recognized agricultural practices that will conserve, restore, and enhance the environmental resources of northwest Mississippi. Founded in 1998, Delta F.A.R.M. has enrolled over 1.3 million acres into its voluntary conservation program, which promotes and documents conservation practices implemented on private lands in the Mississippi Delta.

Benefit of cover crop system-

RobCoker seeking healthy soilprescription

By Doreen Muzzi
Contributing Writer

Planting a winter cover crop has meant healthier soils with less compaction, decreased weed pressure and better internal drainage for one Mississippi farmer.

"We are trying to determine what the monetary benefit is for a cover crop system," says Yazoo City, Miss., soybean and corn producer Rob Coker. "There is a return. What we are doing now is trying to quantify that return."

Coker adopted a no-till production system six years ago, and three years ago he added a cover crop to the mix. In past years, he has used a combination of tillage radishes and a cereal rye mix for his winter plantings, but this year he's trying a new cover crop combination made up of black oats, Mihi Persian clover, and tillage radishes.

The tillage radishes, which produce longer tubers and a long tap root, appear to work well to reduce soil compaction and create routes for water and nutrients to penetrate deeper into the soil structure.

YAZOO CITY, MISS., farmer Rob Coker is utilizing Delta F.A.R.M:s technical assistance program to get the most benefit from his winter cover cropping system.

Macro pores

According to Rachel Stout Evans, a NRCS soil scientist based in Metcalfe, Miss., planting a winter cover crop helps to increase the macro pores in soil, and the larger pore space allows for more oxygen, water, and roots to move through the soil.

"The first 6 inches of soil may be relatively loose due to tillage and seed planting, but below that often lies a compacted layer, which can act as a hard barrier that neither roots nor water can penetrate easily. Increasing the number of macro pores helps loosen the soil and aids in water movement," says Stout Evans.

Coker says, "The cover crop essentially accomplishes the same task as a subsoiler, with an important, added benefit. With a cover crop, you have a channel in the soil held open with a root, and the soil doesn't seal back in the spring like a subsoiling does:'

Soil compaction

In many Delta crop fields, soil compaction allows roots to reach depths of only 4 to 6 inches before those roots begin running laterally. "A lot of rooting zones are much more shallow than is ideal. Water is not properly infiltrating the soil because the compacted soil layer is creating what is essentially a shallow pot that fills up quickly and then overflows. The compacted zone will not allow the water to get through;' she says.

"With more macro soil pores open and the compacted layer gone, the soil can hold or store more water in its entire profile," Stout Evans says. "Those micro pores in tight soils will hold water but won't give the water up easily to plant roots:'

When that soil compaction is relieved, however, roots can reach down 40 inches or more. On a recent visit to one of Coker's fields, Stout Evans found a dead, brown root at a depth of 44 inches and a living white root, which appeared to be a soybean root, at a soil depth of 38 inches. "Grass is a healer. A cover crop with a grass like cereal rye is going to get those roots down quickly;' she says.

Increase nutrient availability

Coker is hoping that getting a corn root system with more roots in the 6 to 12 inches deep zone will provide increased nutrient availability and better water penetration. "That should mean higher yields with less stress and less supplemental water needed," he says. "We've already noticed an improvement in internal drainage, as evidenced by a reduction in ponding areas and a decrease in hot spots:'

In addition to the soil benefits provided by a cover cropping system, Coker says the winter ground cover seems to be decreasing weed pressure, increasing and stabilizing yield, and boosting fertility.

"I'm seeing a drastic decrease in weed pressure;' he says. "Our biggest reduction has been in pigweed, although we have also seen a decrease in Johnson grass, and rye grass pressure. The competing winter vegetation has reduced weed populations, which has allowed us to reduce herbicide sprays:'

Stout Evans says producers who adopt a cover cropping system should also expect a fertility boost over time because a less-compacted soil will allow for better root growth. "The roots of the cover crop will capture nitrogen left over from the cash crop, and when the cover crop decomposes, that nitrogen is then released back to the cash crop in the spring and summer.

"The presence of earthworms tells us that you also gain organic matter and increase biotic activity with this cover crop system;' she adds.

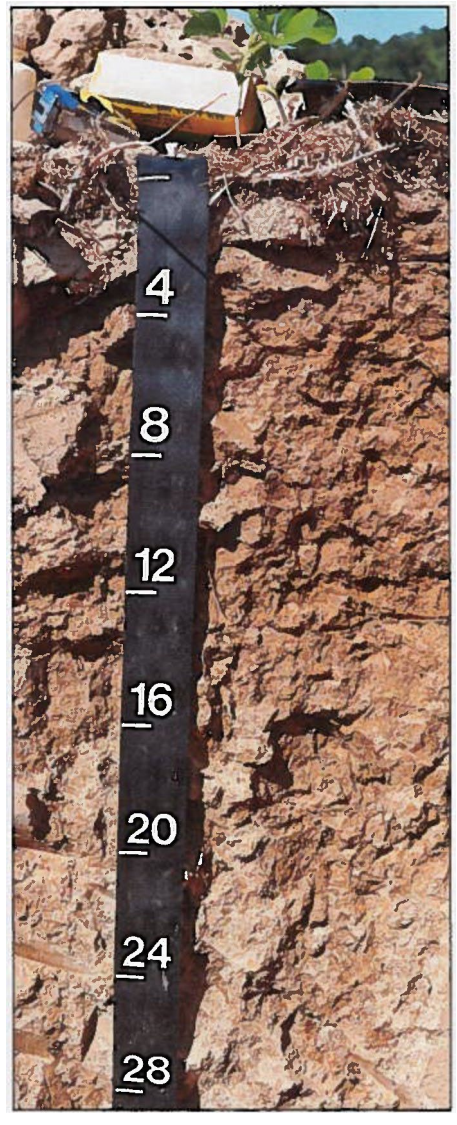
"This is not a quick fix;' says Coker. "It is a long-term commitment, and it can be difficult to stick with because it takes six to 10 years to document the results. After three years, though, we were already seeing an increase in organic matter."

Delta F.A.R.M.

He credits the technical assistance he has received from Delta F.A.R.M. (Farmers Advocating Resource Management) for the benefits he has realized through the utilization of a cover crop system. "This system is working;' Coker says. "Our next goal is to reduce tillage on fields containing irrigation furrows through the use of cover crop plantings:'

The Stoneville, Miss.-based Delta F.A.R.M. was formed in 1998. Its primary objective is providing landowners and farm operators with the technical assistance needed to address environmental concerns without reducing profitability.

For information about how Delta F.A.R.M. can help you, call (662) 686-3370 or go to www.deltafarm.org.



A TAPE MEASURE helps soil scientists better determine soil compaction levels and root depth.

Prevost. Dan

From: Delta F.A.R.M. <news@deltafarm.org>
Sent: Monday, August 13, 2018 10:03 AM
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FARMERS ADVOCATING RESOURCE MANAGEMENT

DELTA F.A.R.M.

March 28, 2017

IN **THIS ISSUE:**

Delta F.A.'R.M. Executive Committee

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Welcome to the

DELTA STEWARD

USA Rice Federation Secure Additional Resources for Delta Rice Producers

USA Rice has secured a $7 Million Regional Conser\'ation Partnership Program (RCPP) grant to be used for rice specific EQJP and CSP contracts in the rice producing counties of Mississippi, Louisiana, Missouri, and Arkansas. Delta F.A.R.M. staff will be working closely \\ th USA Rice and NRCS to enroll producers and pro\'ide them with technical assistance in implementing conservation practices. Enrollment is set to begin during the fall of2017 with implementation of practices to begin during the 2018 growing season.

Operation Pollinator Plantings Completed

Delta F.A.R.M. in partnership with Syngenta's Operation Pollinator planted approximately eight acres of pollinator habitat in four counties in the Mississippi Delta. The last of the acres were planted in March after wet conditions delayed planting. These plots provide \'a]uable habitat for a wide range of pollinators including

,Timmie Dick Carter
Rolling Fork

Rob Coker
Yazoo City

Mattson li'lowers
Clarksda/.

,Jeremy ,Jack
Belzoni

Patrick Johnson, ,Jr.
Tunica

Will Jones
Yazoo City

W.A.Percyll
Greenville

Reese Pillow
Greenwood

Travis Satterfield
Benoit

Darrington Seward
Louise

C.D. Simmons Ill
Arcola

Mike Sturdivant, Jr.
Glendora

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monarch butterflies and honey bees. They can also prove beneficial to farmers by helping them qualify for the NRCS Conservation Stewardship Program.

Soil Health Field Day and Tour

The Arkansas Soil Health Alliance will be hosting a Soil Health Field Day and Farm Tour this Friday, March 31st in Cotton Plant, Arkansas. The morning session will cover some of the technical aspects behind the principles and practices supporting healthy soils while the afternoon will consist of a field tour and equipment demonstration. Adam Chappell will host the afternoon session which will be of particular interest to those striving to integrate cover crops into large-scale furrow irrigated production systems. Please see the following flier for details and RSVP information.

The tour \\ill begin at 9:00am Friday morning at the Farmers Gin Co-op, Cotton Plant, AR. Please RSVP as soon as possible to debbie.morelandpr@gmail.com. Contact Debbie or Dan Prevost, dan@deltawildlife.org, for directions and a complete agenda.

Winter Cover Crop Grazing Update

Last week marked the conclusion of a second season of winter grazing calves on planted cover crops in the Delta. With adequate forage, proper management and stocking, roughly 1 ton of manure per acre is produced per month of grazing. Given a 3 to 4 month winter grazing season, the benefits to soil health and fertility from both the cover crop and manure can add up quickly. The threat of soil compaction is the first issue that comes to mind when considering grazing cattle on the Delta landscape during the winter months. Delta F.AR.M. worked with both NRCS and Mississippi State to evaluate the 2016 corn crop on fields grazed during the 2015/2016 winter season and found no evidence of compaction induced stress on the following crop. There are three main factors which must be considered to prevent compaction:

1. Move the cattle to a new paddock at least once a day.
2. Adjust per acre stocking density based on field conditions.
3. Locate water and hay on or adjacent to turnrows which are already compacted.

Cattle managed under this type grazing system have performed well with average daily gains near 3lbs/day when on good forage in the winter months.

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General Considerations for Planting Cover Crops

When it comes to planting cover crops, having good seed to soil contact and maintaining proper planting depth is as important as when planting a cash crop. The 2014 cover crop trials were initiated in the mid to latter part of the optimal planting window for cover crops.

Aerial broadcast seeding works well for a variety of seed sizes, mixtures, and rates when the seed is broadcast directly onto freshly disturbed soil and either very lightly covered with soil or not covered at all. In no-till situations where cover crop seeds are flown into standing soybeans immediately prior to harvest germination, the establishment of the cover crop is generally poor. Similarly, instances where soil is allowed to crust over after tillage, but prior to aerial seeding, generally result in a poor cover crop stand if the seed is left uncovered.

Calibration of this AT 502 for seeding Winter Triticale, Tillage Radish, and Crimson Clover revealed an optimal swath width of 63 feet with a seven-sixteenth gate opening to achieve a 40- pound-per-acre rate.

Broadcast seeding by ground (TerraGator) works equally as well as aerial seeding when equipment is properly calibrated and soil conditions are good. Poor calibration or improper spreader settings can result in planting skips and poor uniformity. As a general recommendation, when working with seeding rates of 40 to 50 pounds per acre, a more uniform distribution is obtained using higher belt speeds and lower gate settings.


Henbit emerges through planting skips in broadcast Winter Triticale and Tillage Radish.

In field studies, cover crop seed was broadcasted on freshly disturbed soil, and then the seed was covered in some fields and left on the soil surface in other fields. Field work in furrow irrigated fields consisted of a light pass with a hipper roller to cover the seed and prepare a good seed bed for spring planting. Under this situation, it is evident that much of the seed was knocked off the top of the bed and into the furrow, resulting in a sparse stand on top of the bed and a dense stand in the furrow. On flat-planted fields a harrow was used to cover the seed. Overall, on late-planted cover crop fields, no seed coverage scenario resulted in faster germination and better stand growth than in situations where the seed was covered.

Planting with an air-seeder or drill is a preferred planting method in the absence of freshly disturbed soils. Most cover crop mixes (including small seeds) flow very well through the large seed box on most drills. The small seed box works well for lower planting rates of species such as clover, but use caution when using a larger seed such as Tillage Radish at a low seeding rate as metering gears may crush the seed.

Planting with a large span air seeder is a fast, effective, and efficient cover crop planting method.

Cover Crop Planting Window

Cover crops should be planted as early as possible in the fall in order to maximize growth before the winter. This is especially true with a Tillage Radish cover crop, which is more prone to frost kill. Early corn and soybean production systems commonly used in the Mississippi Delta leave room for little, if any, spring growth. Based on the 2014-2015 cover crop trials, the latest cover crop planting date to achieve 100 percent ground coverage is mid-October.

Prevost, Dan

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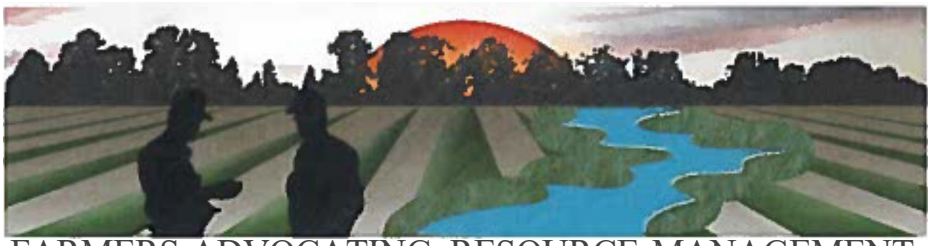

FARMERS ADVOCATING RESOURCE MANAGEMENT

DELTA F.A.R.M.

August 30, 2017

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Tunica

Bobby Carson
Lambert

Jimmie Dick Carter
Rolling Fork

Rob Coker
Yazoo City

Welcome to the

DELTA STEWARD

Task Force Meetings to be Held

DELTA SUSTAINABLE
WATER RESOURCES
TASK FORCE

The Delta Sustainable Water Resources Task Force will hold two meetings in September to inform producers of ongoing and future activities to help address declining water le\'els in the Mississippi River Valley Alluvial Aquifer. One meeting will be at the **Clarksdale Country Club from 10:00-2:00 onSeptember 26:** the other \\ill be at the **Capps Technology Center in Indianola from 10:00-2:00 on September 27.** Lunch will be served at both meetings. The Mississippi Department of Environmental Quality (MDEQ) will present information on 2016 water use, compliance with permit requirements to implement irrigation efficienc) practices, and the status of alternative practices and projects being e,·aluated. The United States Geological Survey (USGS) will discuss preliminary groundwater modeling results comparing the relati\'e effects on aquifer water levels of selected possible alternati\'es and

Mattson Flowers
Clarksdale

Jeremy ,Jack
Belzoni

Patrick Johnson, ,Jr.
Tunica

Will.Jones
Yazoo City

W.A. Percv 11
Greenville

Reese Pillow
Greenwood

'Fmvis Satterfield
Benoit

Dnrrington Seward
Louise

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Arcola

Mike Sturdivant, Jr.
Glendar.a

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show analyses of geophysical data collected. In addition, the USGS will describe additional data collection efforts planned for Federal Fiscal Year 2018 and plans for improving the regional groundwater model. Lee Atwill of the Delta Research and Extension Center will discuss irrigation efficiency practices.

Fall Cover Crop Planting

Cover crops can be used to address a number of yield limiting factors such as soil compaction, water infiltration, and herbicide resistant weeds just to name a few. One of the keys to fully realizing the benefits cover crops can provide is early fall planting in order to maximize growth potential. The ideal cover crop planting window for much of the Delta is September 1 through October 15. It is also important to choose the right cover crop seed blend that fits your soils, production system, and reasons for growing a cover crop. Delta F.A.R.M. staff is available to assist you and your seed dealer in selecting the appropriate mix along with providing recommendations for planting and termination. Please call Dan Prevost at 662-686-3370 for assistance.

Delta F.A.R.M. Hosts TourStop

Delta F.A.R.M. was pleased to host a tour stop for the Entomological Society of America and Mississippi State University Science Policy Field Tour in the Mississippi Delta. The tour included ESA members, beekeepers, NGOs, and sought to educate stakeholders on the importance of balancing pest management and pollinator health. The Delta F.A.R.M. tour stop was in Bolivar County at an Operation Pollinator site. The site is voluntarily enrolled by the landowner and planted in native wildflowers to increase pollinator habitat on working agricultural lands.

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Cover Crop Species Considerations

Wheat is one of the cheapest and easiest winter covers to establish. Planted at 50#/acre, seed cost can range from $8-$18 an acre depending on the source and yearly availability. Wheat will grow on a wide range of soils and sites and is well suited for reducing wind and water erosion and scavenging nutrients. It's relatively shallow root system does little to reduce compacted zones at depths of 4 inches and greater. Wheat is easily terminated late winter through early spring and fits well with March/April planting of corn and soybeans. While the low residue produced by wheat does not interfere with spring planting, it also does not provide an appreciable amount of organic matter back to the system.

CCS Winter Forage Triticale is a hybrid of durum wheat and cereal rye that exhibits good biomass production and rapid early growth in the fall. This is particularly important at later planting dates when rapid foliar growth is necessary for reducing erosion, suppressing weeds and reducing stand damage caused by feeding snow geese. This variety of triticale exhibited good root growth through compacted layers, which we suspect will help improve soil structure and water infiltration throughout the coming growing season. Good and consistent growth was observed across many soil types and survival was noted in low lying areas subject to some winter flooding.

Triticale and Tillage Radish® planted on October 10, 2014, photograph taken February 4, 2015.

Cereal Rye is a winter cover crop that is easy to establish and provides good early growth in the fall. One of the more common and available varieties in the Mississippi Delta is Elbon Rye, which is distinctly different from both annual ryegrass and Italian ryegrass. Research on cereal rye in the Mississippi Delta suggests that this cover crop can improve soil organic matter and water infiltration rates. This is due in part to the large amount of biomass that it can produce given adequate growing time. Cereal rye can also help suppress weed growth through direct competition, development of a thatch layer, and allelopathy (plant produced chemical suppression).

Grass roots of cereal rye growing through a compacted layer of soil. *Photo by Rachel Stout Evans.*

Tillage Radish® is a deep rooted Brassica that is easy to both establish and terminate. This cover crop can produce a tap root that can to depths greater than 4 ft which can help break up deeper compacted zones and create pathways for improved water infiltration. The large tuber that it produces serves as an excellent nutrient scavenger and the ease of termination coupled with rapid decomposition enables a timely release of captured nutrients to the following cash crop. This cover crop has proven to perform very well across a range of soil types in the Mississippi Delta, however it does not grow well in saturated soils or frequently flooded sites.

60 days growth on Tillage Radish planted October 1, 2014 in Bolivar County, MS. While the tap root is broken off in this picture, a soil pit revealed tap root growth to approximately 36 inches.

Hairy Vetch is a drought tolerant winter legume that provides good early growth in the fall and really excels when planted in a mix with other species such as Triticale and Tillage Radish.

Experience suggests that the greater fall growth may result in higher levels of nitrogen fixation in comparison to crimson clover in an early termination situation.


Nodulation recorded Jan. 26, 2015 on Hairy Vetch planted Oct. 1, 2014.

Crimson Clover is a commonly planted legume that serves well for erosion control and nitrogen fixation. In early termination scenarios, early establishment is key to obtaining the growth needed for optimal nitrogen fixation. In the fall/winter of 2014, a planting date of October 1 did not allow for adequate time to fully realize the benefits this plant could provide. When planted in a mix, care should be taken to ensure the seed is not buried too deep, which could delay germination and growth.

Tillage Radish® + Winter Triticale provides excellent ground coverage and root growth when planted on or before mid-October. The absence of a legume lowers the seed cost and makes this mixture more fitting prior to a soybean crop rotation.

The mix of **Tillage Radish® + Winter Triticale + Hairy Vetch** is an excellent cover crop mix, and the addition of a legume provides additional benefits to a subsequent corn crop.

Blending seeds for custom mixtures can easily be accomplished by loading seed boxes with the appropriate ratio of seed and dropping the mixture into a seed tender. In most instances, by the time seed is delivered to the field and augered into the planter or spreader, the seed mix is relatively uniform and sufficient for the intended purpose.

Hairy Vetch planted Oct. 1, 2014 produced good biomass and ground cover by Jan. 26, 2015 (photo date).

Cover crop stand conditions one day prior to a Jan. 26, 2015 termination. Note the larger Tillage Radish experienced frost/freeze mortality. In addition to Tillage Radish, this field also contains Winter Triticale, Hairy Vetch, and Crimson Clover.

Consideration for Planting Cover Crops on Raised Beds

Raised beds are predominant in the Mississippi Delta primarily for improving surface drainage and keeping the plant's "feet dry" in the spring. Although this is a bit counterintuitive, given that the associated tillage associated destroys soil structure, reduces infiltration and increases runoff, maintaining raised beds is important to successfully transition to a cover crop – minimal tillage system. Establishing cover crops successfully on raised beds is highly subjective to soil type and field conditions at planting.

The first and best option for planting covers in a raised bed is with a drill. Both box drills and air seeders have both been used successfully despite concerns over travel distance between the top of the bed and the bottom of the furrow. Drills with parallel linkage and a higher range of travel really excel in these situations, but you generally get enough soil knocked off the bed to cover seed place in the middle where it may be placed shallow or on the surface. Drilling provides the best opportunity for good seed to soil contact, which is absolutely key to successful establishment. A drill also allows you to minimize bed disturbance in the fall. This is especially true with high residue crops such as corn which often require a couple passes with a disk or vertical tillage to chop the residue up enough to flow through a hipper. This process of disking and hipping takes time and encourages moisture loss, two other factors which are key to the successful establishment of covers in the fall.

In many instances a box drill or air seeder isn't available, or a producer may have more acres of covers to plant than he/she can feasibly drill. Broadcasting cover crop seed may be accomplished by air or ground. Broadcasting by air has proven to be faster and slightly more uniform than ground applications. A multi- species mix is not a cause of concern as it will spread just fine with careful attention given to swath width and rate. Depending on the air craft and seed blend, we have observed swath widths ranging from 48 to 60 foot and gate openings ranging from 1/4 to 3/8 inch to achieve 40-50-pound seeding rates. Calibration is equally important in ground applications and one important consideration is slowing of the belt speed in conjunction with gate adjustment so achieve the desired rate while maintaining spinner speed.

Broadcast application of cover crop seed is a very viable option so long as a few key factors are considered when developing a seeding plan. Soil type and tillage intensity are the primary factors influencing soil conditions and integrity of the raised bed. As mentioned earlier, good seed to soil contact is key, and this is where the question of final bed preparation should be made before or after seeding.
Standard practice is to roll or harrow a raised seed bed in order to prepare it in advance for spring planting. The primary question regarding planting covers on raised beds is the sequence of activities i.e. bedding, seeding, rolling. The answer, as with many things cover crop related, is "well it depends".

Mixed to heavy soils tend to do better when rolled or harrowed after seeding. The higher clay content generally results in a more "cloddy" bed that doesn't collapse and cover seed in the middles to deep. On the other hand, lighter soils with high sand/silt content that have been subject to intensive tillage may do better if rolled prior to seeding. On these lighter soils rolling after seeding can knock seed off the top of the bed allowing for "skips" and winter weeds to break through. It can also cover seed in the middles with 2-3 inches of loose soil which could delay or prohibit germination depending on the weather. Most larger seeded cereals, legumes, and brassicas will "embed" fairly well in loose soil but will require a hard rain to provide additional cover and moisture for germination.

One final factor to consider are "stale" beds or those that have been prepared and rained on prior to seeding. Once the soil crusts over under these conditions, it may be necessary to lightly re-work the bed to provide adequate opportunity for proper seed to soil contact.

Cover Crop Termination Timing

Cover crop termination timing is one of the most important decisions affecting the potential success of cover crops towards achieving the intended goal(s). Typical university recommendations for the mid-south suggest terminating cover crops at least six weeks prior to planting the cash crop. However, in early planted corn and soybean systems this can severely limit cover crop growth and performance especially if late planting or a dry fall delayed establishment.

Although early termination may be acceptable for achieving a goal such as erosion control, it could very well limit the cover crop biomass production needed to achieve a goal such as weed control. This is one of the reasons it is very important to establish a set of goals prior to planting and managing cover crops. Examples of cover crop goals and biomass required are listed below.

Low-Moderate Biomass	Moderate-High Biomass
- Maintain bed integrity	- Weed suppression
- Reduce soil erosion	- Reduce compaction
- Increase water infiltration	- Biological nitrogen fixation
- Improve seedling emergence	- Improve nutrient availability
- Reduce sandblasting	- Improve Soil Health

The following images provide examples of early versus late cover crop termination and the amount of biomass that is retained into the growing season. The first example is on a Pearson silt loam where the cover was terminated six weeks prior (January 29) to the target planting date (March 15). Wet weather delated planting until April 2, at which point there was practically no residue left from the cover crop.

Pearson Silt Loam
40#/acre triticale, tillage radish, crimson clover, hairy vetch
Broadcast by air on October 1 on fresh bed and rolled.

April 2 (182 DAP) April 15 (195 DAP)

While the covers in this scenario helped to achieve goals of erosion control and maintaining bed integrity, other observed and measured benefits were minimal. The second scenario is on a Commerce silt loam where the covers were terminated at planting. Although "planting green" requires a higher level of management and there is some risk involved, the benefits provided by the growth and growing season retention of cover crop biomass are substantial.

Commerce Silt Loam
45#/acre cereal rye, black oats, winter pea, hairy vetch
Drilled October 18 - Photo taken March 26 (158 DAP)

Commerce Silt Loam
45#/acre cereal rye, black oats, winter pea, hairy vetch
Drilled October 18 - Photo taken May 9 (201 DAP)