Master Irrigator

North Plains Groundwater
Conservation District

2022 Project Progress Report

Prepared by:

Steve Amosson, Professor Emeritus and Extension Economist, Texas A&M AgriLife Extension Service

June 30, 2022

Executive Summary

The sixth Master Irrigator training was held in March and April at the O'Loughlin Center in Spearman. Twenty individuals initially registered with 16 graduating representing 11 irrigated operations. The total number of irrigated acres represented by participants was 80,375 which made it one of the larger classes with respect to acreage so far. This brings the total to 434,907 irrigated acres represented over the six trainings. Not all this was "new" acreage, some operations have repeated the training with new representatives and a few of the participants also have irrigated operations outside of the district.

Participant ratings of the 2022 training were excellent. On a 5-point Likert scale the overall training rated 4.81 which tied for the highest rating the training has ever received (2018). In fact, participants of the 2022 training rated each individual session higher than all previous years with individual sessions (Agronomics, Irrigation Scheduling, Systems and Systems & Special Topics) rating between 4.69 - 4.88. All 16 participants filling out the final course evaluation indicated they planned on implementing at least some of the information and/or tools they learned in the training. Cumulatively over all trainings **97 of 98 graduates** have indicated that they plan on implementing one or more conservation techniques/practices they learned in the training.

An extensive evaluation of past Master Irrigator graduates continues to be conducted after allowing them at least three years to potentially adopt what they learned in the course. Cumulatively, 93.5% of the respondents to the implementation survey administered to the 2016 - 2018 training graduates reported adopting one or more practices taught in the training. Fifty-five percent of the respondents indicated they had reduced their water use and 86.0% said they had improved their water use efficiency suggesting that graduates are following through with the adoption of water conservation techniques/strategies that they learned in the training.

The ability to offer cost-share funding for implementing conservation practices accelerates adoption and helps to attract producer enrollment in the training. Eighty percent of respondents rated it 6 or higher (10-point Likert scale) suggesting that the possibility of cost-share funding was important in their decision process to attend the training. Currently, the TWDB to make available approximately $250,000 annually in cost-share money to Master Irrigator graduates. Finally, when asked whether the training should be continued to be offered, all 18 respondents (question added after the survey of the 2016 class) said yes.

It can be concluded that the Master Irrigator training is extremely effective. Virtually every graduate of the training has indicated they plan on implementing one or more conservation techniques they learned in the training. Responses to the implementation survey revealed that 93.5% have actually implemented one or multiple conservation practices taught in the course. The resultant implementation of conservation techniques is leading to reduced water use, improved water use efficiency as well as energy savings, reduced soil erosion and improved soil health.

Introduction

The last five regional water plans have all projected that at least parts of the North Plains Groundwater Conservation District (NPGCD) will face major water shortages in the future suggesting conservation and efficient use of current water supplies will be critical to maintain the Agricultural industry in the area. In response, the NPGCD in cooperation with the Natural Resource Conservation Service (NRCS) developed the Master Irrigator project. The goal of this effort is to accelerate producer adoption of water conservation techniques/strategies in the district to prolong the life of the aquifer and maintain the economic viability of the agricultural industry. The overall objective of this project is to develop an educational effort that will improve water use efficiency while potentially reducing water use by irrigators in the district. The centerpiece of this effort was the development of the Master Irrigator training an intensive educational program in water and energy conservation techniques targeted to irrigated producers in the district.

Background and Methodology

Creating an intensive educational project is time intensive and sometimes complicated. While several steps are needed to develop a successful effort, three primary components are ultimately critical: the training, evaluation, and project analysis. Successful design and implementation of these components goes a long way in having effective desired results. The approach used in the national award-winning Master Marketer program served as the blueprint for developing the components of the Master Irrigator project. The first step was the development of an overall plan of action for conducting the project in consultation with the NPGCD personnel and interested producers. The second step was to establish a Project Advisory Committee (PAC) which was charged with providing guidance for the development and implementation of the training and project. In addition, the PAC reviews training results & program evaluations during the life of the project. Members of the PAC included representatives from the NPGCD board & staff, producers, Industry, Natural Resource Conservation Service (NRCS), Texas Water Development Board (TWDB) and Texas A&M AgriLife.

The PAC designed a four-session training including identifying speakers & topics. Registration was limited to 25 due to space limitations but more importantly to ensure that participants could easily interact with speakers. Each session had an overall theme: Session I - Irrigation Scheduling; Session II - Agronomics; Session III - Systems; and Session IV - Special Topics. These one-day sessions were held a week apart under the principle “the mind can’t absorb any more than the butt can withstand”. In subsequent years, the training was moved to the last half of March and the first half of April to further minimize producer scheduling conflicts.

The cost of an intensive educational effort is high, not only in operational dollars, but in time and effort expended. These costs coupled with an unconfirmed source of participation-incentive funding brings up the question of the district’s value of continuing to offer the

Master Irrigator training. To determine the value of the Master Irrigator training, several questions need to be answered:

1. Did producers adopt conservation practices learned in the course?
2. Did producers implementing conservation practices realize improved water use efficiency?
3. Did producers implementing conservation practices realize actual water savings?
4. How important were the participant incentives provided by NRCS?
5. Should NPGCD continue to offer the Master Irrigator training?

A two-level evaluation process is being employed to evaluate the project. The first level of evaluation is of the training itself. Training participants are asked to evaluate the relevance of topics and the effectiveness of speakers for each session. In addition, they are asked for other topics which they would like to see addressed in future trainings. Participant are surveyed to evaluate training topics and speaker effectiveness. Participants were asked to rate topics & speakers using a 5-point Likert scale where 1 = poor and 5 = excellent. In addition, the final evaluation asked them to rate the entire course and give any suggestions for improvement. Results of these surveys are provided to the PAC in consideration for formulating future efforts.

The second level focuses on identifying the level and impact of adoption of conservation equipment and strategies learned in the Master Irrigator training. At the beginning of each training a survey was administered to determine types/amounts of irrigation systems, conservation practices, tillage practices they use. These questions are repeated in the implementation survey. In addition, the implementation survey requests information related to conservation practice implementation, water use efficiency, water savings, importance of funding incentives, suggested improvements to the training and their assessment whether NPGCD should continue to offer the training. This survey is administered to graduates three years after attending the training to measure their level of adoption and their opinions on the value of the course.

2022 & Cumulative Results

The 2022 Master Irrigator training program was held on March 23 (Session I - Agronomics); March 30 Session II - Irrigation Scheduling; April 6 (Session III – Systems); and April 13 (Session IV – Systems & Special Topics). Overall, the topics and most of the speakers were similar to the 2021 training. with one exception: A short presentation on special topics was added to each session. These topics included the “NRCS Rainfall Simulator Demonstration”, “WCC Cover Crop Demonstration Results”, “Mobile Drip Irrigation” and “Carbon Markets: A Potential Source of Income?”. Producer panels remained a critical part of the training, however, representative producers making up the panels changed somewhat. Individual session agendas are located in Appendix A.

Initially a total of 20 registered for the 2022 training, Table 1. Initial registration in previous trainings were near or reached full capacity (25) except for the 2021 (19) and it should be noted that the 2020 class had sold out before it had to be cancelled. Past trainings, due to participant scheduling conflicts the effective number of participants completing all sessions was similar between all five trainings (19 – 22). The 2022 training had three cancel late and one participant only made half of the training, therefore 16 ended up attending all sessions representing 11 irrigated operations which was the smallest graduating class since the inception of the course.

The 2022 training participants reported having 80,375 irrigated acres which was one of the larger classes. However, it should be noted that 60,000 of the irrigated acres reported by participants were in operations where the operator or representatives of the operation had attended a previous training.

The NRCS EQIP cost-share agreement to support the Master Irrigator program came to an end with the 2019 training graduates. The agreement resulted in total of 100 contracts being issued by NRCS providing $1,419,932 in cost-share to Master Irrigator graduates. The NPGCD has entered into an agreement with the Texas Water Development Board to provide cost-share funding for graduates of the Master Irrigator program for the next three years starting with the 2021 training. Under this cost-share agreement approximately $250,000/year will be made available to class graduates for the adoption of water conservation measures. A total of eight contracts were issued to 2021 graduates for $39,725 under this agreement. Applications by the 2022 graduates of the training for the cost-share funds provided by TWDB are still being received, therefore, are not included in this report.

Table 1. Master Irrigator Registration, Irrigated Acreage and Cost-Share Funding by Year.

	2016	2017	2018	2019	2021	2022	Total
Initial Registration	25	26	22	25	19	20	137
Irrigated Acreage	62,090	64,679	86,766	49,259	91,738	80,375	434,907
Cost-Share:							
Contracts	46	38	9	7	8		108
Funding	$ 392,590	$ 390,963	$ 292,811	$ 343,568	$ 39,725		$ 1,459,657

In 2022, the training was held at the O'Loughlin Center in Spearman to attract more producers from the northeast part of the district, and it did result in the largest contingent of enrollees from that area (Hansford (5) and Ochiltree (4)), Table 2. Cumulatively, six of the eight counties have had 10 or more irrigated operations represented at the training. The two counties with less than ten were Lipscomb (9) and Hutchinson (6). Overall, the distribution is what you would expect given each counties proximity to the WCC where most of the trainings have been held and the amount of irrigated acreage within the individual county.

Table 2. Master Irrigator Participant Geographic Distribution, 2016 - 2022.

	2016	2017	2018	2019	2021	2022	Total
Dallam	1	1	2	3	3	0	10
Hansford	5	5	3	2	1	5	21
Hartley	4	4	2	3	6	1	20
Hutchinson	3	1	1	1	0	0	6
Lipscomb	2	3	3	0	0	1	9
Moore	7	10	4	6	5	3	35
Ochiltree	5	3	1	3	3	4	19
Sherman	2	7	8	7	4	2	30

There was a good distribution of the primary crops grown in the NPGCD represented in the training, which was similar to the previous trainings, Table 3. Corn was the most frequently mentioned crop grown (9 times) by the 11 irrigated operations followed by wheat (8 times), sorghum (6 times) and cotton (4 times). These four crops accounted for almost the crops mentioned by participants.

Table 3. Master Irrigator Irrigated Crop Distribution, 2016 - 2022.

	2016	2017	2018	2019	2021	2022	Total
Alfalfa & Hay	3	0	2	0	1	0	6
Corn	19	17	9	14	10	9	78
Cotton	4	7	7	7	3	4	32
Grass	0	2	1	0	0	1	4
Potatoes	1	0	0	0	0	0	1
Oats	0	1	0	0	0	0	1
Sorghum	1	2	4	2	5	6	20
Soybeans	0	0	0	1	0	1	2
Wheat	2	5	5	1	6	8	27

In the 2022 baseline survey, participants reported having a total of 80,375 irrigated acres which averaged 7,307 acres per participant, Table 4. The irrigated acreage represented in the training was larger than the average reported in the first five trainings. The 2022 irrigated acreage average was skewed by participation of two operations that averaged 30,000 acres and the lower number of operations relative to the long-term average.

The distribution between the irrigation delivery systems employed by 2022 participants was similar to previous classes. LEPA accounted for 39.8% of the irrigation systems utilized in NPGCD. The most popular system was LESA with drops 12” – 18” inches above ground accounting for slightly more than 52.0% and MESA systems with drops above 18” are still prevalent (8.0%) while participants reported having a negligible amount of SDI and no furrow irrigation systems. Again, the distribution reported by participants was very similar to the averages reported over all six training where the percentage distribution between systems was 35.1%, 53.1% and 10.9% for LEPA, LESA, and MESA, respectively.

Table 4. 2022 and Cumulative Participant Baseline Survey

2022 Participant Irrigation Baseline Survey

Sprinkler irrigation:	Total Wet Acres (Average)	Total Wet Acres (Sum)	% of Total
MESA - Drops above 18 inches	587	6455	8.03%
LESA - Drops 12" - 18" above ground	3798	41780	51.98%
LEPA - Drops 12" - 18" with bubblers or drag hoses	2909	32000	39.81%
Furrow irrigation		0	0.00%
SDI (DRIP) irrigation	13	140	0.17%
Total Acres	7307	80375	

All Years Participant Irrigation Baseline Survey

Sprinkler irrigation:	Total Wet Acres (Average)	Total Wet Acres (Sum)	% of Total
MESA - Drops above 18 inches	452	47458	10.91%
LESA - Drops 12" - 18" above ground	2200	230971	53.11%
LEPA - Drops 12" - 18" with bubblers or drag hoses	1453	152520	35.07%
Furrow irrigation	3	310	0.07%
SDI (DRIP) irrigation	35	3648	0.84%
Total Acres	4142	434907	

When you look at the irrigation management practices currently utilized by the 2022 participants an interesting trend develops, Table 5. Remote pivot tracking was utilized on almost 90% the irrigated acreage reported by participants and 95% were using flow meters. Ninety-four percent used irrigation scheduling, 79% utilized satellite imagery and 23% employed soil moisture probes. However, when you look at the percentage of irrigated acres using most of these practices is significantly higher than the percentage of producers suggesting larger producers are implementing more of these practices than smaller producers. Participants used weather stations (26%), VRI (14%), drones (9%) and delayed planting dates (15%) to a lesser degree but basically did not use VFDs (6%) or predictive crop models (3%).

Participants reported using some form of conservation tillage on 78% of the acreage. Previous classes the distribution was relatively evenly split between general conservation tillage, strip till and no till. Strip till the most common tillage method practiced (58%) followed by general conservation tillage (22%), no till (14%) and conventional tillage (6%). It also should be noted that this was a significant change from the previous classes which reported a greater amount of conventional till and less conservation tillage. Residue management is being practiced on about 77% of the acreage and in-season fertility management on 84% of the acreage which is higher than what has been reported by participants of previous classes.

Table 5. 2022 Baseline Irrigation Management Practices Reported by Participants

Irrigation Management Practices:	**Do you currently use them?**			
	Yes	No	**Acres**	**% of total**
ET or Weather Station	3	8	21114	26.3%
Variable Frequency Drives	3	8	4940	6.1%
Variable Rate Irrigation	3	8	11506	14.3%
Irrigation Scheduling	6	5	75360	93.8%
Soil moisture probes	3	8	18552	23.1%
Remote pivot tracking	8	3	72046	89.6%
Satellite imagery	5	6	63420	78.9%
Drones	2	9	7320	9.1%
Predictive crop models	1	10	2008	2.5%
Delayed planting dates (corn)	7	4	12032	15.0%
Flow meters	11	0	76321	95.0%
Tillage Practices:				
Conventional tillage	5	6	4795	6.0%
Conservation tillage	7	4	17578	21.9%
Strip Till	6	5	46932	58.4%
No Till	5	6	11071	13.8%
Crop residue management	8	3	61861	77.0%
In-season Fert. Management	7	4	67647	84.2%

Participant evaluations of topics and speaker effectiveness were conducted after every session. Participants were asked to rate topics & speakers using a 5-point Likert scale where 1 = poor and 5 = excellent. In addition, the final evaluation asked them to rate the entire course and give any suggestions for improvement. On such a scale, any rating of 4.0 or better should be considered very good and any rating 4.5 or greater should be considered excellent.

The 2022 training participants rated the overall program 4.81 on the 5-point scale, Table 6. The 2022 rating tied for the highest overall rating with the 2018 training. All individual sessions rated higher than all previous trainings. The sessions on Agronomics, Irrigation

scheduling, Irrigation Systems and Systems & Special Topics rated 4.81, 4.69, 4.88 and 4.88, respectively.

Participant ratings of all individual topics, speakers and comments by session are provided in Appendix B. *All sixteen participants filling out the final course evaluation indicated they planned on implementing at least some of the information and/or tools they learned in the training. Cumulative over all trainings **97 of 98 graduates** have indicated that they plan on implementing one or more conservation techniques/practices they learned in the training.*

Table 6. 2022 Master Irrigator Session and Overall Course Evaluation, 2016 -2022*

	2016	2017	2018	2019	2021	2022
Session I - Agronomics	**4.32**	**4.52**	**4.62**	**4.62**	**4.16**	**4.81**
Session II - Irrigation Scheduling	**4.38**	**4.57**	**4.59**	**4.67**	**4.68**	**4.69**
Sesstion III - Irrigation Systems	**4.69**	**4.81**	**4.50**	**4.52**	**4.47**	**4.88**
Session IV - Systems and Special Topi	**4.62**	**4.70**	**4.62**	**4.62**	**4.53**	**4.88**
Master Irrigator - Overall Training	**4.77**	**4.60**	**4.81**	**4.71**	**4.50**	**4.81**

*Likert 1 - 5 with 1 = poor and 5 = excellent

These and other evaluation topics were addressed by surveying the graduates of the inaugural 2016 Master Irrigator training during 2019. The 2016 class was selected for evaluation in 2019 because adequate time had passed (three years) since the 2016 training to allow graduates to implement and evaluate conservation strategies presented during the Master Irrigator course. This survey procedure was again utilized for the 2017 class and this past winter (2021-2022) to determine conservation practice implementation levels of the 2018 graduates of the training. The survey instrument is located in Appendix C.

A total of 70 individuals graduated from the Master Irrigator training during the 2016 – 2018 time period, Table 7. The 70 graduates included producers, consultants, and various public sector representatives. A total of 56 irrigated operations were represented and graduated from the training. Nine of the 56 operations were no longer in business for various reasons at the time of the implementation survey. Therefore, 47 of the irrigated operations graduating from the training have been surveyed. Each of the operations was contacted multiple times via personal contact, email, text, and phone. A total of 31 graduates responded to the survey, resulting in an effective response rate of 66%.

Table 7 - Master Irrigator graduate implementation survey response summary, 2016 - 2018.

	2016	2017	2018	Total
Number of Graduates	25	23	22	70
Number of Operations	19	19	18	56
Number of Operations no Longer Operating	4	1	4	9
Number of Operations Currently Operating	15	18	14	47
Survey Responses	12	12	7	31
Survey Response Rate	80%	67%	50%	66%

The 31 participants who responded to the follow up survey reported having 98,820 irrigated acres in the baseline survey, Table 8. Therefore, follow-up survey respondents represented 46.3% of the total irrigated acreage represented in these classes.

The implementation survey results from the 31 operations were matched to their responses given in the baseline survey they filled out during their training. Responses were compared to identify changes made in the respondent's operations. Overall, irrigated acres in these operations increased slightly (5,643 acres). A significant change in the type of irrigation systems utilized was reported. The percentage of the least efficient pivot system (MESA) decreased from 14.2% to 11.0% of the total systems in use. The acreage in the most popular LESA pivot systems with spray drops 12" – 18" off the ground also fell between the two surveys (60.8% vs. 54.7%). The biggest change occurred in the use of LEPA systems which increased more than 10,600 acres (8.9%) from what respondents reported in 2017 vs. 2020. The use of SDI increased slightly while the amount of furrow irrigation which was already negligible declined.

Table 8 - Cumulative Baseline and Current Irrigation Systems Utilized by Respondents, 2016 -2018.

Respondent Irrigation Baseline Survey: All Years

Average gpm/ac available? 4.21

Irrigation delivery systems you're using: Sprinkler irrigation:	Total Wet Acres(Average)	Total Wet Acres(Sum)	% of Total
MESA - Drops above 18 inches	451	13,989	14.2%
LESA - Drops 12" - 18" above ground	1,937	60,041	60.8%
LEPA - Drops 12" - 18" with bubblers or drag hoses	736	22,810	23.1%
Furrow irrigation	5	160	0.2%
SDI (DRIP) irrigation	59	1,820	1.8%
Total Acres	3,188	98,820	

Respondent Implementation Survey: All Years

Average gpm/ac available? 4.03

Irrigation delivery systems you're using: Sprinkler irrigation:	Total Wet Acres(Average)	Total Wet Acres(Sum)	% of Total
MESA - Drops above 18 inches	371	11,504	11.0%
LESA - Drops 12" - 18" above ground	1,845	57,193	54.7%
LEPA - Drops 12" - 18" with bubblers or drag hoses	1,079	33,451	32.0%
Furrow irrigation	5	145	0.1%
SDI (DRIP) irrigation	70	2,170	2.1%
Total Acres	3,370	104,463	

The cumulative acreage, percentage use of the irrigation management techniques and tillage practices reported by survey respondents in the baseline and implementation survey (Appendix B) are given in Table 9. Significant increases in the use conservation measures such as, Irrigation Scheduling, Soil Moisture Probes, Remote Pivot Tracking, Drones, Predictive Crop Models, Delayed Planting dates and Water Flow Meters ranged from 14.8% - 63.7%. The only conservation practices that did not increase was the use of Variable Rate Irrigation, weather stations, and VFDs. It should be noted that these increases are somewhat overstated since the amount of irrigated acreage operated by respondents increased (5,643 acres) by the time the implementation survey was conducted.

The trend to implementing more conservation tillage methods is undeniable among respondents. The use of conventional tillage dropped more than 14,000 acres (24,275 – 10,040). All forms of reduced tillage saw substantial increases in use from the baseline as reported by respondents. The percentage distribution between tillage systems reported in the baseline survey was 24.6%, 26.5%, 28.1% and 14.6% for conventional tillage, conservation tillage, Strip Till and No Till, respectively. Summarizing the distribution from the same respondents from the implementation survey resulted in a distribution between these systems of 9.6%, 40.9%, 30.1% and 19.4%, respectively. In addition to these changes, respondents reported a greater emphasis on practicing Crop Residue management (65.8% to 76.1%) and In-season fertility management (84.3% to 84.6%) as conservation measures.

Table 9 - Cumulative Baseline and Current Irrigation Management Practices Utilized by Respondents, 2016 -2018.

	Baseline Survey		Implementation Survey		
Irrigation Management Practices:					
	Acres	**% of total**	**Acres**	**% of total**	**% Change**
ET or Weather Station	46,542	47.1%	45,078	43.2%	-3.1%
Variable Frequency Drives	25,487	25.8%	22,998	22.0%	-9.8%
Variable Rate Irrigation	13,886	14.1%	7,036	6.7%	-49.3%
Irrigation Scheduling	62,701	63.4%	71,976	68.9%	14.8%
Soil moisture probes	38,746	39.2%	47,545	45.5%	22.7%
Remote pivot tracking	80,605	81.6%	96,569	92.4%	19.8%
Satellite imagery	37,350	37.8%	48,367	46.3%	29.5%
Drones	25,528	25.8%	41,795	40.0%	63.7%
Predictive crop models	17,590	17.8%	22,114	21.2%	25.7%
Delayed planting dates (corn)	13,921	14.1%	19,433	18.6%	39.6%
Flow meters	77,077	78.0%	89,801	86.0%	16.5%
Tillage Practices:					
Conventional tillage	24,275	24.6%	10,040	9.6%	-58.6%
Conservation tillage	26,186	26.5%	42,710	40.9%	63.1%
Strip Till	27,747	28.1%	31,453	30.1%	13.4%
No Till	14,451	14.6%	20,259	19.4%	40.2%
Crop residue management	65,066	65.8%	79,468	76.1%	22.1%
In-season Fert. Management	83,277	84.3%	88,369	84.6%	6.1%

Total Responses = 31

In the second section of the implementation survey questions targeting the effectiveness of the training in impacting the participants' operations. Unfortunately, detailed responses to some of the questions were limited, however, response to selected questions are presented in Table 10. Twenty-nine of the 31 respondents (93.5%) indicated that they had adopted or increased the use of at least one or more (average 2.46 practices) of the conservation measures learned during the Master Irrigator course. One of the two respondents that had not implemented any conservation practices taught in the training still has plans to do so. Virtually each topic taught was adopted by one or more participants. This is supported by the changes in irrigation systems, conservation management practices and tillage systems reported by survey respondents detailed in Tables 8 and 9.

The second section of the survey also contained questions requesting feedback on five additional topics; water savings, improvement in water use efficiency, savings from using variable frequency drives (VFDs), the importance of cost-share to attending the training and their opinion on whether NPGCD should continue to offer the training. Two of the primary objectives of the Master Irrigator training are to potentially save water and more production from the irrigation water that is applied. Fifty-five percent of respondents to the implementation survey indicated that they have reduced water use and 86% say that they have improved their water use efficiency, i.e., producing relatively more crop for the water applied.

Participants with variable frequency drives (VFDs) on their irrigation wells were asked how much their energy bill was impacted by using a VFD. Six producers responded reporting an estimated energy reduction of 12%. The next question of the survey was included to help identify the value of the NRCS EQIP cost-share as an incentive to attend the Master Irrigator program. Six respondents reported it was not important at all (rated it a 1 or 2) while 24 (80% of respondents) rated it 6 or higher on a 10-point Likert scale for an overall average of 7.0. Finally, a binary question was added to the implementation survey starting with the 2017 class: "Do you think NPGCD should continue to offer the Master Irrigator program?" All 18 of the respondents indicated in the affirmative that the training should continue to be offered.

Table 10 – Cumulative responses to select questions from the 2016 -2018 Master Irrigator implementation survey.

Have you implemented anything you learned in the MI Training?		**2016**	**2017**	**2018**	**Total**
	Yes	12	12	5	29
	No	0	0	2	2
		% Implemented			**93.5%**
Number of conservation practices adopted?		**2016**	**2017**	**2018**	**Total**
	Respondents	12	**11**	5	28
	Practices	39	**20**	10	69
		Practices/respondent Implemented			**2.46**
Has it decreased your water use?		**2016**	**2017**	**2018**	**Total**
	Yes	8	5.5	2	15.5
	No	4	5.5	3	12.5
		% Decreasing water use			**55.4%**
Has it increased your Water Use Efficiency (WUE)?		**2016**	**2017**	**2018**	**Total**
	Yes	12	8	4	24
	No	0	3	1	4
		% Increasing WUE			**85.7%**
How much do you expect your electrical bill was reduced after using the VFD?		**2016**	**2017**	**2018**	**Total**
	Respondents	3	2	1	6
	Ave. %	7	20	10	
		Weighted Ave. %			**12%**

On a scale of 1-10 how important was cost-share funding in your decision to attend the Master Irrigator training?

Scale	1	2	3	4	5	6	7	8	9	10
					.....Responses.....					
Year										
2016	2						1	2	2	4
2017	2					1	3	4		2
2018	1	1						2	2	1
Total	5	1	0	0	0	1	4	8	4	7

Weighted Average = 7.03

Do you think the NPGCD should continue to offer the MI training?		**2016**	**2017**	**2018**	**Total**
	Yes	0	12	6	18
	No	0	0	0	0
		% Believing the Training should continue			**100%**

Summary and Conclusions

The NPGCD conducted the sixth Master Irrigator training in Spearman during March and April. Twenty originally registered for the training, however, three cancelled late due to conflicts and another was only able to attend two of the sessions resulting in 16 graduating from the course. The sixteen graduates represented 11 irrigated operations, an Extension Specialist, and a crop consultant. For the first time the training was held away from Moore County in Spearman to hopefully attract more producers from the northeast portion of the district. Hansford and Ochiltree counties did lead the enrollees with five and four attendees, respectively. The crop distribution among participants was very similar to past trainings with corn, sorghum, cotton, and wheat accounting for a vast majority of what they grew.

The 11 operations reported having 80,375 irrigated acres. It should be noted that two of the operations that represented 60,000 acres have had representatives at a previous training. An interesting observation was that attendees appeared to be much younger on average than those that have attended previous trainings.

The summary of the baseline survey conducted at the beginning of the course revealed irrigated delivery systems used by participants are primarily LESA (52%), LEPA (40%) and MESA (8%). This is slightly different from what has been observed over all trainings, LESA (53%, LEPA (35%) and MESA (11%). Participants already reported using several conservation practices at a relatively high level. Irrigation scheduling is being used on 93.8% of the acreage, Satellite Imagery 78.9%, and ET/weather stations on 26.3% of the acreage. They reported only 6.0% usage of conventional tillage with the rest in some form of reduced tillage or no till. They also indicated using high levels of crop residue management (77.0%) and In-season fertility management (84.2%).

After each session participants are asked to rate the value of the session on a 5-point Likert scale where 1 = poor and 5 = excellent. In addition, the final evaluation asked them to rate the entire course. The 2022 participants rated each individual session the higher than all previous trainings (Agronomics (4.81), Irrigation Scheduling (4.69), Irrigation Systems (4.88) and Systems and Special Topics (4.88)) with the overall course tying for the highest rating with the 2018 training (4.81). *Every graduate indicated he has or plans to implement one or more irrigation management strategies presented during the course.*

An intensive educational effort such as the Master Irrigator program requires significant resources to execute, therefore it is paramount to identify any realized benefits to evaluate the cost effectiveness of continuing the training. To determine the effectiveness of the Master Irrigator training, irrigated operations were surveyed three years after attending the training to see if and what conservation measures, they had implemented from what was taught. In part, this was accomplished by comparing the respondents baseline survey conducted at the beginning of their training to the implementation survey they filled out.

To date, graduates from the 2016 - 2018 trainings have been surveyed. Representatives from 56 irrigated farms graduated from the 2016 -2018 Master Irrigator trainings, 47 of the operations are still viable and 31 responded to the implementation survey.

The use of more efficient delivery systems trended upward with LEPA usage increasing 8.9% while the less efficient systems MESA and LESA decreased 3.2% and 6.8%, respectively, of the total irrigated acreage. Respondents reduced the use of variable rate irrigation while slightly decreasing the use of weather stations, and variable frequency drives. They increased the use of the other eight conservation practices (Table 9) ranging from 14.8% to 63.8%. There was a major shift in tillage systems with conventional tillage falling more than 14,000 acres (58.6%) while all forms of reduced tillage increased (Conservation Tillage, Strip Tillage, and No Till).

The second section of the implementation survey presents questions targeting the effectiveness of the training in impacting the participants' operations. Twenty-nine of the 31 respondents (93.5%) indicated that they had adopted or increased the use of at least one or more (average 2.46 practices) of the conservation measures learned during the Master Irrigator course.

Fifty-five percent of respondents reported reducing water use based on what they learned in the training. Eighty-six percent indicated that they have improved their water use efficiency, i.e., getting more production per acre-inch applied. Those respondents that have implemented VFDs reported a 12% energy savings.

Respondents were asked to rate (10-point Likert scale) the offer of potential cost-share funding to their decision to attend the training. Overall respondents rated the importance 7.0, however 80% rated it six or higher suggesting that the possibility of cost-share funding was important in their decision process to attend the training. Finally, when asked whether the training should be continued to be offered, all 18 respondents (question added after the survey of the 2016 class) said yes.

There is one conclusion that can be reached concerning the Master Irrigator training: It is extremely effective. Virtually every graduate of the training has indicated they plan on implementing one or more conservation techniques they learned in the training. Responses to the implementation survey revealed that 93.5% have actually implemented one or multiple conservation practices taught in the course. The resultant implementation of the adopted conservation techniques is leading to reduced water use, improved water use efficiency as well as energy savings, reduced soil erosion and improved soil health which were the primary and secondary objectives of the NPGCD in developing/conducting this educational effort.

Appendix A

2022 Master Irrigator Training Agendas:

Session I: Agronomics

Session II: Irrigation Scheduling

Session III: Irrigation Systems

Session IV: Systems and Special Topics

Session I: Agronomics
Wednesday, March 23, 2022
O'Loughlin Center, Spearman, TX

8:30 a.m.	Registration and breakfast
9:00 a.m.	Welcome and Overview *Bob Zimmer, President, North Plains Groundwater Conservation District, Board of Directors*
9:15 a.m.	Economics of Soil Health and Residue Management *Dr. Stephen H. Amosson, Professor and Management Economist Emeritus, Texas A&M AgriLife Extension Service*
9:45 a.m.	Getting a Better Handle on What Roots Do – Agronomically Speaking – *Mick Goedeken, Tillage Systems Agronomist, Orthman Manufacturing*
10:30 a.m.	Break
10:45 a.m.	Infiltration, Water Quality and Soil Carbon Concepts – Part I *Fred Vocasek, Senior Laboratory Agronomist, ServiTech*
12:00 p.m.	NRCS Rainfall Simulator Demonstration *Rick Harrell, Hansford County NRCS Director* *Brandt Underwood, NRCS Zone Agronomist*
12:15 p.m.	Lunch, sponsored by Senninger
1:00 p.m.	Infiltration, Water Quality and Soil Carbon Concepts – Part II *Fred Vocasek, Senior Laboratory Agronomist, ServiTech*
2:00 p.m.	Relationship of Soil Fertility to Water Management *David Reinart, General Manager, Better Harvest*
3:15 p.m.	Break
3:30 p.m.	Using Cover Crops to Improve Soil Health *Kelly Kettner, Parmer County Producer*
4:00 p.m.	Producer Panel: Soil Health and Residue Management *Ronald Meyer* *RN Hopper*
4:40 p.m.	Session I Evaluation
4:45 p. m.	Adjourn

Session II: Irrigation Scheduling
Wednesday, March 30, 2022
O'Loughlin Center, Spearman, TX

8:30 a.m.	Registration and breakfast
9:00 a.m.	Economics of Irrigation Scheduling *Dr. Stephen H. Amosson, Professor and Management Economist Emeritus, Texas A&M AgriLife Extension Service*
9:25 a.m.	Funding Opportunities to Enhance your Water Savings and/or Improve your Water Use Efficiency *Keith Sides, State Irrigation Engineer, USDA-NRCS*
9:45 a.m.	What you need to do to obtain TWDB cost-share funding *Kirk Welch, Assistant General Manager, NPGCD*
10:00 a.m.	Break
10:15 a.m.	Pre-Water and Planting Dates *Dr. Jourdan Bell, Associate Professor and Agronomist, Texas A&M AgriLife Extension Service*
11:15 a.m.	Fundamentals of Crop Water Use and Irrigation Scheduling *Jeff Miller, President, Forefront Agronomy LLC*
12:00 p.m.	WCC Cover Crop Demonstration Results *Dr. Jourdan Bell, Associate Professor and Agronomist, Texas A&M AgriLife Extension Service*
12:15 p.m.	Lunch, sponsored by AquaSpy
1:00 p.m.	Measuring Crop Water Use *Dr. David Sloane, Principal Agronomist, GroGuru*
2:30 p.m.	Break
2:45 p.m.	Data Interpretation & Strategic Irrigation Management *Dr. David Sloane, Principal Agronomist, GroGuru*
4:00 p.m.	Producer Panel: Irrigation Scheduling *Justin Crownover* *Tom Moore* *Braden Gibson*
4:40 p.m.	Session II Evaluation
4:45 p.m.	Adjourn

Session III: Systems
Wednesday, April 6, 2022
O'Loughlin Center, Spearman, TX

8:30 a.m.	Registration and breakfast
9:00 a.m.	Economics of Irrigation Systems *Dr. Stephen H. Amosson, Professor and Management Economist Emeritus, Texas A&M AgriLife Extension*
9:30 a.m.	Systems and Application Efficiency *Leon New, Agricultural Engineer, Retired*
10:30 a.m.	Break
10:45 a.m.	Systems and Application Efficiency (Continued)
11:50 a.m.	Mobile Drip Irrigation *Clive Puttick, Southwest Territory MGR, Dragon-Line*
12:15 p.m.	Lunch, sponsored by Reinke
1:00 p.m.	Genset: A potential alternative for converting natural gas to electric powered irrigation *Nicholas Kenny, NPK Ag, LLC*
1:45 p.m.	Center Pivot Remote Monitoring & Management *Karlyle Haaland, Site Manager for PivoTrac Valley Irrigation, Inc.*
2:45 p.m.	Break
3:00 p.m.	Decision Support using Zone Economics *Jeff Hamlin, Senior Customer Success Manager, The Climate*
4:00 p.m.	Producer Panel: Center Pivot Irrigation *Harold Grall* *Justin Garrett* *Braden Gibson*
4:40 p.m.	Session III Evaluation
4:45 p.m.	Adjourn

Session IV: Systems & Special Topics
Wednesday, April 13, 2022
O'Loughlin Center, Spearman, TX

8:30 a.m.	Registration and breakfast
9:00 a.m.	2021 Crop Profitability Analyzer *Dr. Stephen H. Amosson, Professor and Management Economist Emeritus, Texas A&M AgriLife Extension Service*
9:30 a.m.	Variable Frequency Drives Benefits in Agriculture *Jeff Childs, Sales Engineer, Yaskawa America Inc.*
10:15 a.m.	Break
10:30 a.m.	Remote Sensing uses in Agriculture *John Gibson, Precision Ag Specialist, Crop Quest*
11:30 a.m.	The NPGCD/TWDB Cost-share Program for MI Graduates *Kirk Welch, Asst. General Manager, NPGCD*
12:00 p.m.	Carbon Markets: A Potential Source of Income? *Dr. Justin Benavidez, Assistant Professor and Management Economist, Texas A&M AgriLife Extension Service*
12:15 p.m.	Lunch Sponsored by Netafim
1:00 p.m.	Subsurface Drip Irrigation Systems *Jerry Funck, Owner, Professional Water Management Associates*
2:30 p.m.	Break
2:45 p.m.	SDI Versus Sprinkler – WCC Demonstration Results *Nicholas Kenny, NPK Ag. LLC*
3:15 p.m.	Producer Panel: SDI and Remote Sensing *Jon Englebrecht* *Danny Krienke* *Bryce Williams*
4:00 p.m.	Session IV & Course Evaluation
4:15 p.m.	Graduation and Closing Reception *Steve Walthour, General Manager, NPGCD* *Kathleen Jackson, Texas Water Development Board Dir.*
4:45 p.m.	Adjourn

Appendix B

2022 Master Irrigator Training – Participant Evaluation Results

Session I: Agronomics

Session II: Irrigation Scheduling

Session III: Irrigation Systems

Session IV: Systems and Special Topics

Overall Master Irrigator Course Assessment

Program Evaluation Master Irrigator Program - Spring 2022
Session I – Agronomics- 16 Responses

1. How would you rate the information presented in the **Economics of Soil Health, and Residue Management** session? (Steve Amosson)
   1. (Poor) 1 2 3 4 5 (Excellent)
   1 1 2 12 Ave. = 4.50

2. How would you rate the quality of the presenter?
   1. (Poor) 1 2 3 4 5 (Excellent)
   3 13 Ave. = 4.81

3. How would you rate the information presented in the **Getting a Better Handle on What Roots Do – Agronomically Speaking** session? (Mick Goedeken)
   1. (Poor) 1 2 3 4 5 (Excellent)
   3 13 Ave. = 4.81

4. How would you rate the quality of the presenter?
   1. (Poor) 1 2 3 4 5 (Excellent)
   3 2 11 Ave. = 4.50

5. How would you rate the information presented in the **Infiltration, Water Quality and Soil Carbon Concepts** sessions? (Fred Vocasek)
   1. (Poor) 1 2 3 4 5 (Excellent)
   1 4 11 Ave. = 4.63

6. How would you rate the quality of the presenter?
   1. (Poor) 1 2 3 4 5 (Excellent)
   1 2 13 Ave. = 4.75

7. Did you find value in the **NRCS Rainfall Simulator Demonstration**?
   1. (Poor) 1 2 3 4 5 (Excellent)
   2 2 12 Ave. = 4.63

8. How would you rate the information presented in the **Relation of Soil Fertility to Water Management** session? (David Reinart)
   1. (Poor) 1 2 3 4 5 (Excellent)
   3 2 11 Ave. = 4.50

9. How would you rate the quality of the presenter?
   1. (Poor) 1 2 3 4 5 (Excellent)
   1 1 2 4 8 Ave. = 4.06

10. How would you rate the information presented in the **Using Cover Crops to Improve Soil Health** session? (Kelly Kettner)
    1. (Poor) 1 2 3 4 5 (Excellent)
    3 13 Ave. = 4.81

11. How would you rate the quality of the presenter?

1. (Poor) 1 2 3 4 5 (Excellent)

1 2 13 Ave. = 4.75

12. How would you rate the **Producer Panel** session?

1. (Poor) 1 2 3 4 5 (Excellent)

1 3 12 Ave. = 4.69

13. How would you rate the Overall ***Agronomics*** session?

1. (Poor) 1 2 3 4 5 (Excellent)

3 13 Ave. = 4.81

What should be deleted/added/changed to improve this session?

Learned a lot. Thank you

Make handouts bigger in notebooks

Program Evaluation Master Irrigator Program - Spring 2022
Session II – Irrigation Scheduling – 16 Responses

1. How would you rate the information presented in the **Economics of Irrigation Scheduling** session? (Steve Amosson)

   (Poor) 1 2 3 4 5 (Excellent)
   1 3 5 7 **Ave. = 4.13**

2. How would you rate the quality of the presenter?

   (Poor) 1 2 3 4 5 (Excellent)
   3 4 9 **Ave. = 4.38**

3. How would you rate the value of the NRCS session **describing Funding Opportunities to Enhance your Water Savings and/or Improve your Water Use Efficiency.** (Keith Sides)

   (Poor) 1 2 3 4 5 (Excellent
   2 4 10 **Ave. = 4.50**

4. How would you rate the information presented in the **Pre-Water and Planting Dates** session? (Jourdan Bell)

   (Poor) 1 2 3 4 5 (Excellent)
   1 2 13 **Ave. = 4.75**

5. How would you rate the quality of the presenter?

   (Poor) 1 2 3 4 5 (Excellent)
   2 14 **Ave. = 4.75**

6. How would you rate the information presented in the **Fundamentals of Crop Water Use and Irrigation Scheduling** session? (Jeff Miller)

   (Poor) 1 2 3 4 5 (Excellent)
   1 4 11 **Ave. = 4.63**

7. How would you rate the quality of the presenter?

   (Poor) 1 2 3 4 5 (Excellent)
   3 2 11 **Ave. = 4.50**

8. Did you find value in the **WCC Cover Crop Demonstration Results**?

   (Poor) 1 2 3 4 5 (Excellent)
   4 12 **Ave. = 4.75**

9. How would you rate the information presented in the **Irrigation Scheduling** sessions? (David Sloane)

   (Poor) 1 2 3 4 5 (Excellent)
   2 1 13 **Ave. = 4.69**

10. How would you rate the quality of the presenter?

    (Poor) 1 2 3 4 5 (Excellent)
    1 3 12 **Ave. = 4.69**

11. How would you rate the **Producer Panel** session?

(Poor) 1 2 3 4 5 (Excellent)

1 4 11 Ave. = 4.63

12. How would you rate the Overall ***Irrigation Scheduling*** session?

(Poor) 1 2 3 4 5 (Excellent)

1 3 12 Ave. = 4.69

What should be deleted/added/changed to improve this session?

Power points in book are too small to read

** 17 attended the session, however one had to leave early and did not complete the evaluation

Program Evaluation Master Irrigator Program
Spring 2022

Session III: Irrigation Systems- 17 Responses

1. How would you rate the **Economics of Irrigation Systems** session? (Steve Amosson)
   1. (Poor) 1 2 3 4 5 (Excellent)
   1 2 1 5 8 Ave. = 4.00

2. How would you rate the quality of the presenter?
   1. (Poor) 1 2 3 4 5 (Excellent)
   1 1 3 4 8 Ave. = 4.00

3. How would you rate the **Systems and Application Efficiency** session? (Leon New)
   1. (Poor) 1 2 3 4 5 (Excellent)
   2 15 Ave. = 4.88

4. How would you rate the quality of the presenter?
   1. (Poor) 1 2 3 4 5 (Excellent)
   2 2 13 Ave. = 4.65

5. Did you find value in the **Mobile Drip Irrigation Discussion**?
   1. (Poor) 1 2 3 4 5 (Excellent)
   1 4 12 Ave. = 4.53

6. How would you rate the **Genset: A potential alternative for converting natural gas to electric powered irrigation** session? (Nich Kenny)
   1. (Poor) 1 2 3 4 5 (Excellent)
   3 14 Ave. = 4.82

7. How would you rate the quality of the presenter?
   1. (Poor) 1 2 3 4 5 (Excellent)
   1 16 Ave. = 4.94

8. How would you rate the **Center Pivot Monitoring & Management** session? (Karlyle Haaland)
   1. (Poor) 1 2 3 4 5 (Excellent
   1 3 13 Ave. = 4.71

9. How would you rate the quality of the presenter?
   1. (Poor) 1 2 3 4 5 (Excellent)
   1 3 13 Ave. = 4.71

10. How would you rate the **Decision Support using Zone Economics** session? (Jeff Hamlin)
    1. (Poor) 1 2 3 4 5 (Excellent)
    1 1 15 Ave. = 4.82

11. How would you rate the quality of the presenter?
    1. (Poor) 1 2 3 4 5 (Excellent)

1 4 12 Ave. = 4.65

12. How would you rate the **Producer Panel** session?

1. (Poor) 1 2 3 4 5 (Excellent)

3 14 Ave. = 4.82

13. How would you rate the overall *Irrigation Systems* session?

1. (Poor) 1 2 3 4 5 (Excellent)

2 15 Ave. = 4.88

What should be deleted/added/changed to improve this session?

___Zone Economics best presentation of the course_

Program Evaluation Master Irrigator Program
Spring 2022

Session IV: Systems & Special Topics – 16 Responses

1. How would you rate the **2021 Crop Profitability Analyzer** session? (Steve Amosson)
   1. (Poor) 1 2 3 4 5 (Excellent)
   2 4 10 **Ave. = 4.50**

2. How would you rate the quality of the presentation?
   1. (Poor) 1 2 3 4 5 (Excellent)
   1 1 3 11 **Ave. = 4.50**

3. How would you rate the **Variable Frequency Drives** session? (Jeff Childs)
   1. (Poor) 1 2 3 4 5 (Excellent)
   1 2 13 **Ave. = 4.75**

4. How would you rate the quality of the presentation?
   1. (Poor) 1 2 3 4 5 (Excellent)
   1 2 1 12 **Ave. = 4.50**

5. How would you rate the **Remote Sensing** session? (John Gibson)
   1. (Poor) 1 2 3 4 5 (Excellent)
   1 1 2 12 **Ave. = 4.56**

6. How would you rate the quality of the presentation?
   1. (Poor) 1 2 3 4 5 (Excellent)
   1 1 2 12 **Ave. = 4.56**

7. How would you rate **Carbon Markets: A Source of Income session?** (Justin Benavidez)
   1. (Poor) 1 2 3 4 5 (Excellent)
   1 1 1 2 11 **Ave. = 4.31**

8. How would you rate the quality of the presentation?
   1. (Poor) 1 2 3 4 5 (Excellent)
   1 1 2 12 **Ave. = 4.56**

9. How would you rate the **Subsurface Drip Irrigation Systems** session? (Jerry Funck)
   1. (Poor) 1 2 3 4 5 (Excellent)
   1 2 13 **Ave. = 4.75**

10. How would you rate the quality of the presentation?
    1. (Poor) 1 2 3 4 5 (Excellent)
    3 13 **Ave. = 4.81**

11. How would you rate the **SDI vs. Sprinkler Dem. Results** session? (Nich Kenny)
    1. (Poor) 1 2 3 4 5 (Excellent)
    3 13 **Ave. = 4.81**

12. How would you rate the quality of the presentation?

1. (Poor) 1 2 3 4 5 (Excellent)
3 13 **Ave. = 4.81**

13. How would you rate the **Producer Panel** session?

1. (Poor) 1 2 3 4 5 (Excellent)
2 14 **Ave. = 4.88**

14. How would you rate the overall *Systems* & ***Special Topics*** session?

1. (Poor) 1 2 3 4 5 (Excellent)
2 14 **Ave. = 4.88**

What should be deleted/added/changed to improve this session?

Overall 2022 Master Irrigator Course Assessment

How would you rate the entire four-session Master Irrigator Training?

(Poor) 1 2 3 4 5 (Excellent)
1 1 14 **Ave. = 4.81**

What are the main benefits you received from this training?

1. Learning ways to improve the efficiency of my pivots
2. I learned a lot about soils, no-till, cover crops and pre watering
3. We need to always try to be better
4. Management strategies
5. Soil health and probes (mentioned twice)
6. Understanding water use efficiency
7. Just to manage my farm a little better
8. Producer panels – their experiences
9. Irrigation systems and scheduling
10. Better knowledge of technologies I knew existed but have no experience with
11. A little bit of everything – very informative

What did you expect from the Master Irrigator training that you *did not* receive?

1. Nothing (mentioned three times)
2. More pivot knowledge but everything was good

What session / topic was the *most* useful?

1. Session I (mentioned three times)
2. Session II
3. Session III
4. Session IV (mentioned twice)

5. All were very good especially the crop profitability analyzer, cover crops and tillage
6. All the sessions were useful
7. Soil probes (mentioned twice)
8. Pivo Trac, Climate Field View, SDI and SDI vs LEPA demonstration results
9. Irrigation timing and different methods of watering
10. Nozzeling and equipment for sprinklers

What session / topic was the *least* useful?

1. Session I (mentioned twice)
2. Session II
3. Session III (mentioned twice)
4. Session IV (mentioned twice)
5. All Sessions were useful (mentioned five times)
6. Economics of Irrigation Systems
7. DragonLine
8. Carbon session (mentioned twice)

Do you plan to use/adopt the information/tools you learned during your Master Irrigator training?

Yes __16____ No ___0___

Additional Comments: (**If we have permission to use your comments in advertising the training in the future, please sign.)**

1. Maybe hold it earlier in the year when it isn't so busy
2. I appreciate the experience, learned a lot of information I didn't know.
3. This was probably the most educational/beneficial producer seminar I have taken

Appendix C

Three Year Post Implementation Survey

Master Irrigator Follow-up Survey

Name: _____ Date: _____

County or counties you operate in: _____

Primary crops grown? _____ Average gpm/ac available? _____

Current Irrigation delivery systems you're using:

Sprinkler irrigation:	**Total Wet Acres**
MESA – Drops above 18 inches	_____
LESA – Drops 12" – 18" above ground	_____
LEPA - Drops 12" – 18" with bubblers or drag hoses	_____
Furrow irrigation	_____
SDI (DRIP) irrigation	_____

Current Irrigation Management Practices:	Do you currently use them?		If **yes**, what % of irrigated land is it practiced on?
ET or Weather Station	YES	NO	_____%
Variable Frequency Drives	YES	NO	_____%
Variable Rate Irrigation	YES	NO	_____%
Irrigation Scheduling	YES	NO	_____%
Soil Moisture Probes	YES	NO	_____%
Remote Pivot Tracking or monitoring	YES	NO	_____%
Satellite Imagery/Remote Sensing	YES	NO	_____%
Drones	YES	NO	_____%
Predictive Crop Models	YES	NO	_____%
Delayed Planting Dates	YES	NO	_____%
Flow Meters	YES	NO	_____%
Tillage Practices:			
Conventional Tillage	YES	NO	_____%
Conservation Tillage	YES	NO	_____%
Strip Till	YES	NO	_____%
No Till	YES	NO	_____%
Other Practices:			
Crop Residue Management/Soil Health	YES	NO	_____%
In-season Fertility Management	YES	NO	_____%

Master Irrigator Follow-up Survey

1. Have you implemented anything you learned in the Master Irrigator training into your operation? YES / NO
    a. If YES, what have you implemented?

        i. Has it decreased your water use? YES / NO How much? _____ ac-in/acre
        ii. Has it improved your water use efficiency? YES / NO
            If YES, what crop(s) and how much?
            _____ (Crop) _____bu. or lbs./ac-in
            _____ (Crop) _____bu. or lbs./ac-in

    b. If NO, do you plan on implementing anything you learned in the future? YES / NO
        i. If YES, what are you thinking about implementing?

        ii. What factors have prevented you from implementing it?

2. If you have a VFD, what was the average annual bill **prior to** using the VFD? $_____
   How much do you feel your bill was reduced **after** you started using the VFD? _____%
   Are there other benefits that your operation has experienced by utilizing a VFD?

3. On a scale of 1 to 10, with 1 being not important and 10 being very important, please rate the offer of NRCS EQIP cost-share funding in your decision to attend the Master Irrigator training?

1	2	3	4	5	6	7	8	9	10
NOT IMPORTANT									VERY IMPORTANT

4. Do you think the NPGCD should continue to offer this training? YES / NO

5. What was the most important information you received from the training?

6. What changes would you suggest any to improve the Master Irrigator program?