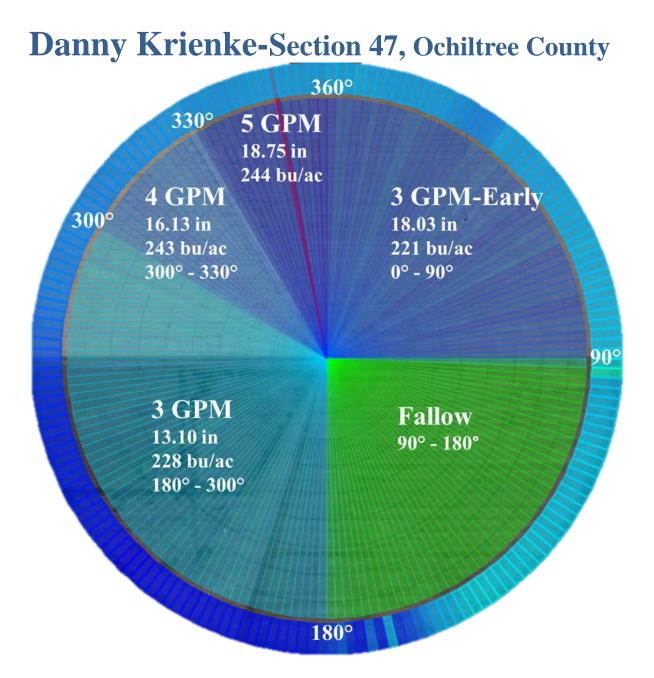
"3-4-5 Gallon Production Maximization Corn Demonstration Project", 2017





The District's "3-4-5 GPM" Project Demonstrates Advanced Technologies, Strategic Methods and Practices Producing Corn Using 3, 4 and 5 Gallons per Minute per Acre Irrigation Capacity to Achieve Optimum Grower Bottom Dollar Gain Managing Soil Water Levels that Supports Plant Development Requirements and Ready Additional Evaluation and Adoption.



The "3-4-5 GPM" field scale demonstration project is achieved by writing a prescription that controls the center pivot travel speed by remote telemetry to apply 1.10 inches each week for the 3 GPM fields, 1.49 inches for the 4 GPM fields, and 1.85 inches per week for the 5 GPM fields. The water intensity map above illustrates where the 3 GPM, 4 GPM, 5 GPM, and 3 GPM-Early planted fields are located, the different amounts of irrigation applied, and the resulting corn yields for Danny Krienke's 2017 Demonstration. Each 3, 4, 5 GPM travel speed prescription is based on what the GPM individual center pivots are nozzled to apply.

Principal Participants

Harold Grall - Moore County Cooperator (NPGCD Director) Danny Krienke - Ochiltree County Cooperator (NPGCD Director) Stan Spain - Moore County Cooperator <u>Principal Staff</u> Leon New - Agricultural Engineer (District Conservationist) Curtis Schwertner – Natural Resource Specialist (NPGCD)

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Executive Summary

The "3-4-5 Gallon Production Maximization (GPM)" project is a three-year, on-farm, field-scale project that demonstrates how water conservation technologies and irrigation management practice adjustments can reduce groundwater use and allow agricultural irrigation producers to remain profitable and financially viable with limited and/or diminishing groundwater resources.

In 2015, the North Plains Groundwater Conservation District planned and initiated the "3-4-5 GPM" field demonstrations based on applying 1.10 inches of irrigation weekly using an irrigation capacity of 3 gallons per minute (GPM) per acre, 1.49 inches using 4 GPM, and 1.85 inches using 5 GPM irrigation capacity. These weekly amounts of irrigation represented one 120 acre center pivot correctly nozzled, pressured, and managed to apply 360 gallons per minute (3 GPM), 480 (4 GPM), and 600 gallons (5 GPM) as typically used by any grower. Similarly, a 500 acre half mile center pivot was nozzled to apply 1500 gallons (3 GPM), 2000 gallons (4 GPM), and 2500 (5GPM).

Following results and data from the previous five-year "200-12" project, the "3-4-5 GPM" project was established to provide information on where to apply groundwater to provide its most profitable use. Field data collected and tabulated from growers' fields in the five-year "200-12" project showed promising, optimum corn yields and profitability where center pivot irrigation systems were nozzled for 3.0 and 4.0 GPM per acre. That data showed some "200-12" project fields were overwatered managing 4.0 GPM per acre, especially when excessive pre-water was pumped. Likewise, some corn production fields were significantly overwatered, where center pivots were nozzled for 5.0 GPM per acre. Advanced technology and management tools can be conveniently utilized to improve efficiency and increase conservation for both 4 GPM and 5 GPM per acre corn production.

In 2015, the "3-4-5 GPM" project's first year, five cooperating growers committed 700 acres to achieve initial field demonstration results. In 2016, the project's second year, five cooperating growers dedicated 654 acres to obtain additional demonstration results. In 2017, the final year of the project, Danny Krienke planted 180 acres in Ochiltree County, Harold Grall planted 241 acres in Moore County, and Stan Spain planted 94 acres, of which 39 acres were Sub-surface Drip Irrigation (SDI) in Moore County. Krienke, Grall, and Spain also demonstrated the benefit of high efficiency water application LEPA and PMDI center pivot irrigation systems within the "3-4-5 GPM" project.

Appendix A is a summary of demonstration corn hybrids planted, seeding rates, irrigation amounts, and harvest results. **Appendix B** shows corn yield per inch of irrigation applied by all cooperating growers in each "3, 4, 5" field. **Appendix C** describes bushels produced from each inch of irrigation for 3, 4, 5 GPM fields and by field. **Appendix D** lists net return from each inch of irrigation by field and grower plus water and harvest data. **Appendix E** describes net return from each inch of irrigation, rainfall, and soil water for all growers and for each 3, 4, 5 GPM field. **Appendix F** describes net return per acre for each grower and 3, 4, 5 GPM field. Next are the results from the 2017 cooperating producer fields.

Stan Spain SDI Fields

In Moore County, Spain produced 10 more bushels per acre in his 3 GPM SDI field than the 4 GPM field with 2.16 less inches of irrigation. The 3 GPM field produced 12 more bushels per acre than the 5 GPM

with 4.32 less inches of irrigation. The 4 GPM yield was 2 more bushels per acre than that from the 5 GPM field with 2.16 less inches of irrigation. Corn production was 26.82 bushels (1,501 lb.) per inch of irrigation in the 3 GPM field compared to 21.38 bushels (1,197 lb.) in the 4 GPM field, and 18.09 bushels (1,013 lb.) from the 5 GPM field.

The 3 GPM field's net gain was \$40.05 per acre with 2.16 inches less irrigation used compared to production from the 4 GPM field. The 3 GPM field's net gain compared to the 5 GPM field was \$58.77 per acre with 4.32 less inches of irrigation. Net gain for the 4 GPM field was \$18.72 per acre more than the 5 GPM with 2.16 inches less irrigation. Net return from each inch of irrigation was \$54.96 for the 3 GPM field compared to \$42.24 from the 4 GPM and \$34.73 for the 5 GPM field. Net return from each inch of total water was \$23.79 for the 3 GPM field, \$20.27 for the 4 GPM field, and \$18.06 for the 5 GPM field.

Stan Spain LEPA Fields

In Moore County, Spain produced 10 more bushels per acre in the 4 GPM center pivot LEPA field than the 3 GPM field, and irrigation was 2.29 inches more. The 5 GPM field produced 10 more bushels per acre than the 3 GPM with 4.56 more inches of irrigation. The 4 GPM yield and 5 GPM yield were both 270 bushels per acre, but the 4 GPM field used 2.27 less inches of irrigation. Corn production was 22.85 bushels (1,279 lb.) per inch of irrigation in the 3 GPM field compared to 19.75 bushels (1,106 lb.) in the 4 GPM, and 16.94 bushels (948 lb.) from the 5 GPM field.

The 4 GPM field's net gain was \$12.46 per acre with 2.29 inches more irrigation used compared to production from the 3 GPM field. The 3 GPM field's net gain compared to the 5 GPM field was \$1.62 more per acre with 4.56 less inches of irrigation. Net gain for the 4 GPM field was \$14.08 per acre more than the 5 GPM with 2.29 inches less irrigation. Net return from each inch of irrigation was \$45.32 for the 3 GPM field compared to \$38.64 from the 4 GPM and \$32.25 for the 5 GPM field. Net return from each inch of total water was \$21.49 for the 3 GPM field, \$20.09 for the 4 GPM field, and \$18.00 for the 5 GPM field.

Harold Grall LEPA Fields

In Moore County, Grall produced 4 more bushels per acre in the 4 GPM LEPA field than the 3 GPM field with 4.76 more inches of irrigation. The 5 GPM field produced 1 bushel per acre more than the 3 GPM with 6.36 more inches of irrigation. The 4 GPM yield was 3 bushels per acre more than that from the 5 GPM field with 1.60 less inches of irrigation. Corn production was 18.04 bushels (1,010 lb.) per inch of irrigation in the 3 GPM field compared to 13.45 bushels (753 lb.) in the 4 GPM and 12.19 bushels (682 lb.) from the 5 GPM field.

The 3 GPM field's net gain was \$18.86 per acre with 4.76 inches less irrigation used compared to production from the 4 GPM field. The 3 GPM field's net gain compared to the 5 GPM field was \$36.78 per acre with 6.36 less inches of irrigation. Net loss for the 5 GPM field compared to the 4 GPM was \$17.92 per acre with 1.60 inches more irrigation. Net return from each inch of irrigation was \$34.76 for the 3 GPM field compared to \$24.43 from the 4 GPM field, and \$21.50 for the 5 GPM field. Net return

from each inch of total water was \$18.82 per acre for Grall's 3 GPM LEPA field, \$15.07 for the 4 GPM field, and \$13.69 for the 5 GPM LEPA field.

Danny Krienke LEPA Fields

In Ochiltree County, the 4 GPM field produced 15 more bushels per acre than the 3 GPM field with an additional 3.03 inches of irrigation. The 5 GPM field produced 16 more bushels per acre than the 3 GPM with 5.65 more inches of irrigation. The 5 GPM yield was 1 more bushel per acre than that from 4 GPM field with 2.62 additional inches of irrigation. Production in the 3 GPM-Early field was 7 less bushels per acre than the 3 GPM field, 22 bushels less than in the 4 GPM field, and 23 less bushels than in the 5 GPM field. Corn production was 17.40 bushels (974 lb.) per inch of irrigation in the 3 GPM field compared to 15.06 bushels (844 lb.) in the 4 GPM field and 13.01 bushels (729 lb.) from the 5 GPM field. Production in the 3-Early planted field was 12.26 bushels (686 lb.) per inch of irrigation.

The 4 GPM field's net gain was \$21.21 per acre with 3.03 inches more irrigation used compared to production from the 3 GPM field. The 5 GPM field's net gain compared to the 3 GPM field was \$7.62 per acre with 5.65 additional inches of irrigation. Net loss for the 5 GPM field compared to the 4 GPM was \$13.59 per acre with 2.62 inches more irrigation. Net return from each inch of irrigation was \$33.07 for the 3 GPM field compared to \$28.17 from the 4 GPM field, \$23.51 for the 5 GPM field, and \$20.56 from the 3 GPM-Early planted field. Net return from each inch of total water was \$18.37 per acre for the 3 GPM field, \$16.39 for the 4 GPM field, \$15.08 for the 5 GPM field, and \$13.47 per inch from his 3 GPM-Early planted field. Net return per acre was \$433.25 for the 3 GPM field, \$454.45 for 4 GPM field, \$440.87 for GPM field, and \$370.72 for 3 GPM-Early planted field.

Harold Grall PMDI Fields

In Moore County, Grall produced 7 more bushels per acre in the 4 GPM field than the 3 GPM field, and irrigation was 4.76 inches more. The 5 GPM field produced 6 more bushels per acre than the 3 GPM field with 6.36 more inches of irrigation. The 5 GPM yield was 1 fewer bushel per acre than that from 4 GPM field with 1.60 additional inches of irrigation. Corn production was 16.89 bushels (946 lb.) per inch of irrigation in the 3 GPM field compared to 12.78 bushels (715 lb.) in the 4 GPM acres and 11.67 bushels (654 lb.) from the 5 GPM field.

The 3 GPM field's net gain was \$10.87 per acre with 4.76 inches less irrigation used compared to production from the 4 GPM field. The 3 GPM field's net gain compared to the 5 GPM field was \$23.45 per acre with 6.36 less inches of irrigation. Net gain for the 4 GPM field compared to the 5 GPM was \$12.58 per acre with 1.60 inches less irrigation. Net return from each inch of irrigation was \$31.71 per acre for the 3 GPM field compared to \$22.64 from the 4 GPM field and \$20.13 for the 5 GPM field. Net return from each inch of total water was \$17.16 for Grall's 3 GPM PMDI field, \$13.96 for the 4 GPM PMDI field, and \$12.82 for the 5 GPM PMDI field.

2017 Irrigation Systems within the "3-4-5 GPM" Project

2017 Harold Grall LEPA and PMDI Fields

In Moore County, the 3 GPM LEPA field produced 15 more bushels per acre than the 3 GPM PMDI field. Irrigation in each field was 13.08 inches. The 4 GPM LEPA field produced 12 more bushels per acre than the 4 GPM PMDI field, and irrigation was 17.84 inches for each field. The 5 GPM LEPA field produced 10 more bushels per acre than the 5 GPM PMD; irrigation was 19.44 inches for both fields.

Corn production was 18.04 bushels (1,010 lb.) per inch of irrigation in the 3 GPM LEPA field compared to 16.89 bushels (946 lb.) in the 3 GPM PMDI. In the 4 GPM fields, production was 13.45 bushels (753 lb.) per inch of irrigation for LEPA and 12.78 bushels (715 lb.) for PMDI. Production in the 5 GPM LEPA field was 12.19 bushels (682 lb.) from each inch of irrigation as compared to 11.67 bushels (654 lb.) per inch in the 5 GPM SDI field.

Irrigation, rainfall, and net soil water totaled 24.16 inches in the 3 GPM LEPA field and also in the 3 GPM PMDI field. Production from each inch of total water was 9.77 bushels (547 lb.) for the 3 GPM LEPA and 9.15 bushels (5,12l lb.) for 3 GPM PMDI. Production from 28.92 inches of total water in the 4 GPM LEPA field was 8.30 bushels (464 lb.) compared to 7.88 bushels (441 lb.) from each of 28.92 inches for the 4 GPM PMDI field. Total water was 30.52 inches for the 5 GPM LEPA field from which production was 7.76 bushels (435 lb.) per inch. Total water in the 5 GPM PMDI field was 30.52 inches from which production was 7.43 bushels (416 lb.) per inch.

Net return from each inch of irrigation is \$34.76 for the 3 GPM LEPA field and \$31.71 per inch for the 3 GPM PMDI field. In the 4 GPM LEPA field, net return per inch of irrigation was \$24.43 per inch and \$22.64 for 4 GPM PMDI field. Net return for the 5 GPM LEPA field was \$21.50 from each inch of irrigation and \$20.13 per inch from the 5 GPM PMDI field.

Net return per acre was \$454.70 for the 3 GPM LEPA field and \$414.73 for the 3 GPM PMDI field. Net return for the 4 GPM LEPA field was \$435.85 per acre and \$403.86 for the 4 GPM PMDI field. In the 5 GPM LEPA field, net return was \$417.93 per acre compared to \$391.28 per acre for the 5 GPM PMDI field.

Stan Spain LEPA and SDI Fields

In Moore County, the 3 GPM SDI field produced 17 more bushels per acre than the 3 GPM center pivot LEPA field. Irrigation in the SDI field was 10.33 inches and 11.38 in the LEPA field. The 4 GPM LEPA field produced 3 more bushels per acre than the 4 GPM SDI field. Irrigation was 13.67 inches per acre for the LEPA field and 12.49 inches for the SDI field. The 5 GPM LEPA field produced 5 more bushels per acre than the 5 GPM SDI field. Irrigation was 15.94 inches for the 5 GPM LEPA field compared to 14.65 inches in the SDI field.

Corn production was 26.82 bushels (1,501 lb.) per inch of irrigation in the 3 GPM SDI field and 22.85 bushels (1,279 lb.) in the 3 GPM LEPA field. In the 4 GPM field, production was 19.75 bushels (1,106

lb.) per inch of irrigation for LEPA and 21.38 bushels (1,197 lb.) for SDI. Production in the 5 GPM LEPA field was 16.94 bushels (948 lb.) from each inch of irrigation and 18.09 bushels (1,013 lb.) per acre for the 5 GPM SDI field.

Irrigation, rainfall, and net soil water totaled 23.86 inches per acre in the 3 GPM SDI field and 24.00 inches in the 3 GPM LEPA field. Production from each inch of total water was 11.61 bushels (650 lb.) for the 3 GPM SDI and 10.83 bushels (606 lb.) for 3 GPM LEPA. Production from 26.29 inches of total water in the 4 GPM LEPA field was 10.27 bushels (575 lb.) compared to 10.26 bushels (574 lb.) from the 4 GPM SDI field. Total water was 28.56 inches per acre for the 5 GPM LEPA field from which production was 9.45 bushels (529 lb.) per inch. Total water in the 5 GPM SDI was 28.18 inches per acre from which production was 9.40 bushels (526 lb.) per inch.

Net return from each inch of irrigation was \$45.32 for the 3 GPM LEPA field and \$54.96 per inch for the 3 GPM SDI field. For the 4 GPM LEPA field, net return per inch of irrigation was \$38.64 per inch compared to \$42.24 for 4 GPM SDI field. Net return per acre for the 5 GPM LEPA field was \$32.25 from each inch of irrigation compared to \$34.73 per inch for the 5 GPM SDI field.

Net return per acre was \$515.76 for the 3 GPM LEPA field and \$567.59 for the 3 GPM SDI field. Net return for the 4 GPM LEPA field was \$528.22 per acre and \$527.54 per acre for the 4 GPM SDI field. For the 5 GPM LEPA field, net return was \$514.14 per acre compared to \$508.82 per acre for the 5 GPM SDI field.

Harold Grall T-L PMDI Field

In Moore County, Grall produced 12.17 bushels (681 lb.) per acre from each inch of irrigation with his T-L PMDI center pivot. Net return from each inch of irrigation was \$20.15 per acre. Net return per acre was \$322.87. Irrigation capacity was 2.82 GPM per acre from two wells from which seasonal water meter readings averaged 338 GPM. The T-L oil hydraulic drive center pivot was not readily remote guided for the "3, 4, 5 GPM" Variable Rate Irrigation (VRI) by travel speed control, but provided valuable on-site irrigation system corn production data for area growers to evaluate for potential adoption.

Stan Spain "3-4-5 GPM" SDI Cotton Fields

In Moore County, Spain produced 185 pounds per inch of irrigation in the 3 GPM field compared to 158 pounds in the 4 GPM and 89 pounds from the 5 GPM field. Production from each inch of irrigation, rainfall, and net soil water that totaled 23.13 inches was 51 pounds per acre in the 3 GPM field. Irrigation, rainfall, and net soil water totaled 22.87 inches in the 4 GPM field where production was 52 pounds per inch. In the 5 GPM field, irrigation, rainfall, and net soil water totaled 23.65 inches where production was 32 pounds per inch of total water.

At \$0.5668 per pound of lint cotton produced, gross value from each inch of irrigation applied was \$104.97 per acre for the 3 GPM field compared to \$89.63 for the 4 GPM and \$50.67 for the 5 GPM. Gross value of each inch of irrigation, rainfall, and net soil water measured that totaled 23.13 inches in

the 3GPM field was \$29.13. Value of the 22.87 inches of irrigation, rainfall, and net soil water measured in the 4 GPM field was \$29.39. Irrigation, rainfall, and net soil water totaled 23.65 inches in the 5 GPM field for which the gross value was \$18.38 from each inch. Gross value of cotton produced in the 3 GPM field was \$673.92 per acre compared to \$672.22 for the 4 GPM and \$434.74 for the 5 GPM field. **Appendix K** highlights the "3-4-5 GPM" SDI cotton production details.

"3-4-5 GPM" Project 3-Year Summary

Five progressive, innovative, cooperating growers developed valuable corn production guideline information conducting 60 field-scale water management demonstrations on 1,869 acres following strategic protocol for the three-year "3- 4-5 GPM" project. Corn yield averaged 223 bushels (12,488 lb.) per acre from the 3 GPM fields, 232 bushels (12,992 lb.) from the 4 GPM fields, 242 bushels (13,552 lb.) from the 5 GPM field, and 226 bushels (12,656 lb.) per acre from the 3 GPM Early planted fields.

Corn yield averaged 18.17 bushels (1,017 lb.) per inch of irrigation in the 3 GPM fields, 15.66 bushels (877 lb.) from the 4 GPM fields, 14.40 bushels (806 lb.) from the 5 GPM fields, and 14.94 bushels (836 lb.) per inch from the 3 GPM-Early planted fields. Yields averaged 8.74 bushels (489 lb.) from each inch of irrigation, rainfall, and net soil water in the 3 GPM fields, 8.47 bushels (474 lb.) from the 4 GPM fields, 8.38 bushels (469 lb.) from the 5 GPM fields, and 7.72 bushels (432 lb.) per inch in the 3 GPM-Early planted fields.

Irrigation averaged 12.61 inches per acre in the 3 GPM fields, 15.28 inches in the 4 GPM fields, 17.36 inches in the 5 GPM fields, and 15.57 inches per acre in the 3 GPM-Early planted fields. Irrigation, rainfall, and net soil water averaged 25.66 inches per acre in the 3 GPM fields, 27.39 inches per acre in the 4 GPM fields, 28.94 inches in the 5 GPM fields, and 29.34 inches per acre in the 3 GPM-Early planted fields.

Net return averaged \$417.08 per acre in the 3 GPM fields compared to \$422.59 in the 4 GPM fields, \$434.94 per acre in the 5 GPM fields, and \$404.16 per acre in the 3 GPM-Early planted fields. Net return from each inch of irrigation averaged \$33.08 from the 3 GPM fields, \$27.66 from the 4 GPM fields, \$25.03 from the 5 GPM fields, and \$25.96 per inch from the 3 GPM-Early planted fields. Net return from each inch of total water averaged \$16.25 for the 3 GPM fields compared to \$15.43 for the 4 GPM fields, \$15.03 from the 5 GPM fields, and \$13.78 per inch from the 3 GPM-Early planted fields.

The above crop production costs and net returns were based on 2017 costs as follows: \$6.20 per inch of irrigation, \$3.33 per thousand seeds planted per acre, \$0.36 per bushel harvest expense, nutrient costs provided by Better Harvest, and corn priced at \$3.63 per bushel. 2017 completed the 3-year "3-4-5 GPM" demonstration project

Appendix G describes the 3-year average planting dates, seeding rates, irrigation, and harvest results. **Appendix H** describes the 3-year bushels per inch of irrigation by grower. **Appendix I** describes the 3-year per inch of irrigation by 3, 4, 5 GPM field and grower. **Appendix J** summarizes the 3-year bushels per inch of total water by 3, 4, 5 GPM field and grower.

Introduction

In 2015, the North Plains Groundwater Conservation District planned and initiated a field demonstration identified as the "3-4-5 Gallon Production Maximization (GPM)" project that would use the latest water conservation technologies and practices to grow corn irrigated at three different amounts weekly as needed. The project was based on applying 1.10 inches of irrigation weekly using an irrigation capacity of three (3) gallons per minute (GPM) per acre, 1.49 inches using four (4 GPM), and 1.85 inches from five (5 GPM). These weekly amounts of irrigation represented one 120 acre center pivot correctly nozzled and managed to apply 360 gallons per minute (3 GPM), 480 (4 GPM), and 600 gallons (5 GPM). Similarly, a 500 acre half-mile center pivot was nozzled to apply 1500 (3 GPM) gallons per minute (GPM), 2,000 gallons (4 GPM), and 2,500 (5 GPM). The "3-4-5 GPM" project was planned for a three-year period with 2017 being the final year.

Following results and data from the previous five-year 200-12 project, the "3-4-5 GPM" project was established to provide information on "where to put your groundwater" to provide its most profitable use? Field data collected and tabulated from growers' fields in the 200-12 project showed promising, optimum corn yields and profitability where center pivot irrigation systems were correctly designed and nozzled for 3.00 and 4.00 GPM per acre. The data showed some project fields were overwatered managing 4 GPM per acre, especially when excessive pre-water was pumped and seasonal beneficial rainfall was more than 9 inches. Where center pivots were nozzled for 5 GPM per acre, some corn production fields were significantly overwatered, for which advanced technology can be conveniently utilized for both 4 and 5 GPM per acre corn production to improve groundwater use crop productivity and efficiency.

The "200-12" project was a five-year initiative that provided field-scale profitability and feasibility demonstrations of producing 200 bushels of corn utilizing 12 inches of irrigation water combined with seasonal rainfall and available water within the crop's root zone. The previous "200-12" project was conducted on 6,247 acres by 13 cooperating growers in 2010 through 2014. Corn irrigation averaged 21.00 inches per acre, while irrigation, rainfall, and net soil water averaged 31.00 inches over the 10-year Agri-Partner field demonstration project conducted by AgriLife Extension from 1998 through 2007. The Agri-Partner project included 129 field scale corn demonstrations on 18,815 acres with approximately 150 cooperating growers over the 10 year period. NPGCD stepped up to the next level, based on what was learned from the "200-12" and Agri-Partner projects. That was to arrange and demonstrate corn production using center pivot systems to apply managed 3, 4, and 5 GPM per acre irrigation capacity, or similar, with no or only limited pre-water. The "3-4-5 GPM" project demonstrated how water conservation technologies and irrigation management practices can reduce water use and allow agricultural irrigation producers to remain financially viable with restricted and diminishing groundwater resources. The demonstrations must utilize high efficiency Low Energy Precision Application (LEPA) or Low Elevation Spray Application (LESA) in canopy center pivot irrigation systems combined with strip or no till and crop residue management farming practices. The "3-4-5 GPM" project was designed as a three-year initiative that provided field-scale profitability and feasibility demonstrations of variable rate irrigation (VRI) by speed control to apply 1.10 inches (3 GPM), 1.49 inches (4 GPM), and 1.85 inches (5 GPM) of groundwater weekly as needed for corn production combined with seasonal rainfall and available water within the crop's root zone guided by 24/7 soil water sensor monitoring.

In 2015, the "3-4-5 GPM" project's first year, 5 cooperating growers committed 700 acres to achieve initial field demonstration results. In 2016, 5 cooperating growers committed 654 acres, of which 19 acres were Sub-surface drip (SDI). In 2017, **Harold Grall** dedicated 241 acres in Moore County, **Danny Krienke** used 180 acres in Ochiltree County, and **Stan Spain** planted 94 acres, of which 39 acres were Sub-surface Drip Irrigation (SDI), at the Districts' WCC in Moore County. Additional information was compiled in 2015 and 2016 for the "3-4-5 GPM" project and 2010, 2011, 2012, 2013, and 2014 for the previous "200-12 project and can be obtained from the website: northplainsgcd.org/education. The District office is located at 603 East 1st street, Dumas, Texas. (806) 935-6401.

Methods

Each of the 3 cooperators individually selected 3, 4, and 5 GPM acres, also described as sectors of a circle, within fields irrigated by one center pivot system for the demonstration. Irrigation within the selected acres/sectors/fields was managed to apply 1.10 inches (3 GPM), 1.49 inches (4 GPM), and 1.85 inches (5 GPM) according to North Plains Groundwater Conservation District's (District) "3-4-5 GPM" project protocols and guidelines. Each cooperator established and wrote a variable center pivot travel speed prescription to apply the different irrigation amounts no more often than weekly. Center pivot travel speed was programmed and managed by either Pivotrac or Lindsey Mfg. Field Net telemetry. Individual irrigation amounts were achieved by slowing travel speed down when the system exited each 3 GPM acres/sector and entered the 4 GPM to apply 1.49 inches of irrigation. Travel speed was reduced again as the system exited the 4 GPM and entered the 5 GPM sector/field to apply 1.85 inches. When the system exited the 5 GPM sector into the 3 GPM, travel speed was increased to apply 1.10 inches of irrigation. Actual individual center pivot travel speed is dependent on the system's nozzle package gallons per minute. The district's project leader received pre-programmed text notification when each center pivot entered and departed individual acres/sectors or fields that was recorded and used to calculate individual 3, 4, 5 GPM sector/field irrigation amounts based on weekly on-site water meter GPM flow.

Each cooperator individually chose commercially available corn hybrids based on their experience as growers. Planting dates, seeding and fertilizer rates, as well as pesticide and herbicide applications, were also selected by each cooperator. At each center pivot demonstration site, the District installed water meters to record and verify the amount of irrigation applied on each field, rain gauges to measure rainfall, gypsum block moisture sensors at 1, 2, 3, 4, and 5 foot depths in the crop's root zone to monitor soil water content, and AquaSpy® continuous soil water monitoring probes down to 48 inches. Each irrigation system was equipped with PivoTracTM or Lindsey Mfg. Field Net remote continuous tracking and control to manage and monitor irrigation application. Each cooperator was provided soil and plant leaf sampling for each 3, 4, 5 GPM sector/field four times during the growing season by Better Harvest, Inc. to monitor and guide fertility levels. During the growing season, District personnel collected water, soil moisture, crop growth, and other data and maintained recording equipment weekly in each demonstration field. The District's tabulated demonstration field data is included with each cooperator individual report that follows in this report. Cooperators and the District's conservationist used the realtime data from AquaSpy®, PivoTrac[™], and Lindsey Mfg. Field Net websites along with the data collected at least weekly from each demonstration field to monitor crop and soil moisture conditions, as well as to monitor and manage irrigation frequency and volumes in the 3 GPM, 4 GPM and 5 GPM

fields/sectors. Individual irrigation amounts were calculated using each text message from Pivotrac to the District conservationist who recorded when irrigation stopped in one sector and began in the other sector. The time the irrigation system was in the 3 GPM, 4 GPM, and 5 GPM sectors/fields in combination with weekly gallons per minute (GPM) water meter readings, established a method to track irrigation. All demonstrations began at planting and ended at harvest, which each cooperator managed.

The District compared harvest and irrigation results from each 3 GPM, 4 GPM, and 5 GPM sector/field for each grower, and to that of other cooperators in the project. Yields for each field were adjusted to reflect 15.00% moisture content for corn based on the formula used by the National Corn Growers Association. The District analyzed production gains and losses based on a corn price of \$3.63 per bushel. A common crop production expense relating to irrigation, seed, fertilizer, and harvest costs was established for the comparison. The common price for seed was \$3.33 per thousand, irrigation was \$6.20 per inch applied, and harvest was \$0.36 per bushel. Fertilizer costs were calculated for each field based on basic nutrients removed to produce the corn yield harvested. Method of calculation and nutrient prices was provided by Better Harvest. The District did not analyze land costs because land costs are highly variable between growers and across the District. Variable rate irrigation (VRI) prescriptions were written using the same information required to prepare a normal center pivot precipitation chart. The following discussion provides detailed growing season data, results, and information for each grower's 3 GPM, 4 GPM and 5 GPM acres/sectors/fields measured and recorded in 2017, the third and final year for the "3-4-5 GPM" project.

Stan Spain's 2017 Moore County SDI Corn Demonstration

2017 Planting and Crop Information, SDI Corn, Spain

Stan Spain strip tilled and planted 19.44 acres of corn in the south half of section 47 for his "3, 4, 5 GPM" SDI demonstration. The SDI acres were positioned between two LEPA center pivot irrigation systems. There are 16 irrigation zones in the SDI system divided in the north and south by a field road. Each north zone is 2.43 acres. Zone 3 was Spain's 5 GPM field, zone 4 was the 4 GPM field, and zone 5 was the 3 GPM field. Three irrigation plans were developed and run by Field Net to apply the project's weekly irrigation amounts. Each plan irrigated two zones simultaneously and three times each week. The plan applied 0.38 inches each 56 hour cycle to apply 1.14 inches per week for the 3 GPM field, 0.50 inches each cycle to apply 1.50 inches for the 4 GPM field, and .062 inches to apply 1.86 inches for the 5 GPM field. The south SDI acres were planted to cotton and irrigated in sequence with the north acres. Spain planted each "3, 4, 5 GPM" corn field to Dynagro D58VC53 hybrid. Seeding rate was 32,000 seeds per acre for the 3 GPM, 4 GPM, and 5 GPM acres. Seasonal water meter readings averaged 153 GPM (for 2.00 - 2.43 acre zones). Irrigation was with Netafim 13 mil Typhoon series SDI tape laterals spaced 30 inches apart with 0.18 GPH TurbONet emitters spaced 24 inches. Planting and crop information for "Spain 3 GPM", "Spain 4 GPM", and "Spain 5 GPM" LEPA are shown in the Table 1 below.

3 GPM Demons	tration Site: Zone 5							
Planted	May 24	Harvested	October 28					
Hybrid	Dynagro D58VC53	Seeding Rate	32,000					
Row Width	30 inches	Tillage	Strip Till					
No. Acres	2.43	GPM per acre	3.00					
Total Water	23.86 inches	Soil Type	Sherman Clay Silty Loam					
Irrigation	10.33 inches	Insecticide	Prevathon, Warhawk, Rifle					
4 GPM Demons	tration Site: Zone 4							
Planted	May 24	Harvested	October 27					
Hybrid	Dynagro D58VC53	Seeding Rate	32,000					
Row Width	30 inches	Tillage	Strip Till					
No. Acres	2.43	GPM per acre	4.00					
Total Water	26.02 inches	Soil Type	Sherman Clay Silty Loam					
Irrigation	12.49 inches	Insecticide	Prevathon, Warhawk, Rifle					
5 GPM Demons	tration Site: Zone 3							
Planted	May 24	Harvested	October 27					
Hybrid	Dynagro D58VC53	Seeding Rate	32,000					
Row Width	30 inches	Tillage	Strip Till					
No. Acres	2.43	GPM per acre	5.00					
Total Water	28.18 inches	Soil Type	Sherman Clay Silty Loam					
Irrigation	14.65 inches	Insecticide	Prevathon, Warhawk, Rifle					

Table 1: 2017 Planting and Crop Information, SDI Corn, Stan Spain

2017 Soil Water Profile and Growing Season Rainfall, SDI Corn, Spain

"3 GPM" SDI Demonstration Site

Rainfall in March and April finished refilling the soil profile to needed levels prior to planting. Preseason soil water was good at 1, 2, 3, 4, and 5 feet. Weekly gypsum block readings indicated the crop used more than irrigation and rainfall provided and removed stored water from 1 and 2 feet by mid – July at the 10 leaf growth stage using 90% of that stored at 1 foot and 75% from 2 feet. The 7.05 inches of rainfall in August refilled the profile. Plant roots developed into 3 feet in September during grain maturity using about 55% of that stored, 100% from 2 feet and 50% from 1 foot plus irrigation and rainfall. The sensors showed no soil water was used from 4 and 5 feet in the root zone. Rainfall in September and October refilled soil water at 1, 2, 3, 4, and 5 feet by harvest leaving good levels for the 2018 crop. Soil moisture sensors showed the crop had adequate soil water during the growing season. The crop was produced in Sherm silty clay loam that can store approximately 2.00 inches of available water per foot for potential crop use. Rainfall from planting until grain black layer totaled 13.53 inches.

"4 GPM" SDI Demonstration Site

Soil water was good at 1, 2, 3, 4, and 5 feet at planting from preseason rainfall. Soil moisture sensors showed plant roots began using water from 1 foot in the root zone at the 10 leaf growth stage in mid-July and from 2 feet in late July at pollination in addition to irrigation and rainfall. Plants used 90% of the water stored at 1 foot and 60% of that at 2 feet. Abundant rainfall in August refilled the soil profile to beginning levels which were maintained by irrigation and rainfall that followed leaving a full soil profile at the end of the season. Sensors showed no soil water was used from 3, 4, and 5 feet producing the crop. Weekly gypsum block readings showed the crop had adequate soil moisture during the growing season. No net soil water was used. A total of 13.53 inches of rainfall was recorded from planting through black layer. Soil was Sherm silty clay loam that holds approximately 2.00 inches available water per foot for potential crop use.

"5 GPM" SDI Demonstration Site

Beginning soil water was good at 1, 2, 3, 4, and 5 feet at planting from preseason rainfall. Soil moisture sensors show plant roots removed water from 1 foot the first week in July at the 10 leaf growth stage in addition to irrigation and rainfall. Plants used about 85% of the water stored at 1 foot and 50% of that stored at 2 feet in the root zone in mid to late July at tassel and pollination. No additional soil water was used until mid- September during grain maturity when about 20% of soil water stored at both 3 and limited amounts from 1 and 2 feet was used. Rainfall in October refilled the soil profile to the levels at planting. Weekly gypsum block moisture sensors showed the crop had sufficient available soil water during the entire growing season. Rainfall was 13.53 inches. Irrigation totaled 14.65 inches. No net soil water was used. The crop was produced in Sherm silty clay loam soil that holds 2.00 inches of available water per foot for potential crop use.

GPM	June (in)	July (in)	August (in)	September (in)	October (in)	Total (in)
3, 4, 5	1.86	0.45	7.05	2.98	1.19	13.53

Table 2: 2017 Monthly Rainfall Data, SDI Corn, Spain

2017 Growing Season Water Tracking, SDI Corn, Spain

The district tracked total water and crop growth throughout the growing season using rain gauges, water meters, and both gypsum blocks and AquaSpy® soil moisture sensors. One set of five gypsum block soil moisture sensors was installed at 1, 2, 3, 4, and 5 feet, and an AquaSpyTM soil moisture probe was installed down to four feet in the root zone at one location to monitor soil water levels in the "3 GPM" field. Another set of the same type of sensors were installed in each "4 GPM" and "5 GPM" fields. Both the gypsum block sensors and the soil probe were installed in close proximity to each other in each field. Gypsum blocks, water meters, rain gauges and crop growth are read, recorded and utilized weekly by district personnel. Each AquaSpy® probe was installed following crop emergence. A 24/7 Aquaspy probe website shows soil moisture at four inch increments to 48 inches and monitors plant root growth. The website lists all Aquaspy soil probes in the "3, 4, 5, GPM" project and was available to all cooperators and district personnel. Another 24/7 Pivotrac website tracks each center pivot system and monitored and controlled irrigation. The SDI irrigation plans written to apply 1.14 inches ("3 GPM"), 1.50 inches ("4 GPM"), and 1.86 inches ("5 GPM") was managed from the Field Net website. Both the cooperating grower and district "3, 4, 5 GPM Project Leader collectively monitored, controlled, and managed irrigation from the Field Net website.

Following this paragraph, a series of graphs and tables shows weekly gypsum block readings for the season; growing season water, including rainfall, irrigation, and soil moisture at various growth stages; and the order of irrigation and rainfall events for each "3, 4, 5, GPM" field. "Water Summary," as shown on the graph for growing season water, is the sum of seasonal irrigation, rainfall, and net soil water. Graphs and tables for the 3 GPM acres are shown first, followed by the same illustrations for each 4 GPM and 5 GPM.

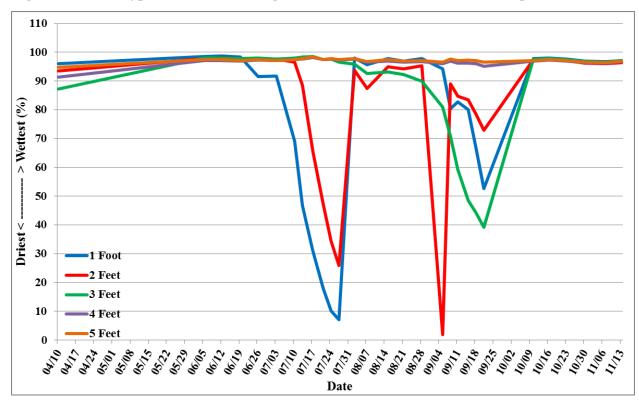
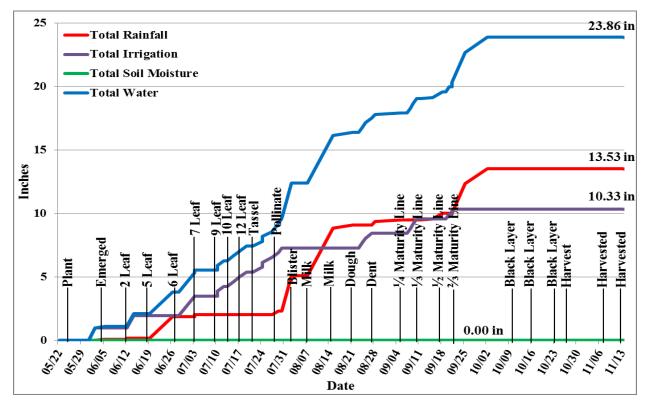


Figure 1: 2017 Gypsum Block Readings, "3 GPM" SDI Corn, 277 bu/ac, Spain

Figure 2: 2017 Growing Season Water Tracking, "3 GPM" SDI Corn, 277 bu/ac, Spain



Date	Time	Rainfall (inches)	Irrigation (inches)	Growth Stage	1 Foot		il Mositu 3 Feet	ire 4 Feet	5 Feet	Zone Irrigating	Filter Sta. Meter GPM	Filter Sta. PSI	Field Meter GPM	Zone Man. PSI	Zone Man. PSI	Source
03/27		0.33	(inclices)	Buge	11001	21000	51000	41000	51000	inguing	meter or m	54.151	01.111	inum r pr		Curtis
04/03		2.06														Curtis
04/10	10:05 AM	0.58			96.1	93.6	87.3	91.3	94.7	off						C & L
04/24		0.77														Curtis
05/01		1.51														Curtis
05/15		0.48														Curtis
05/23		0.38														Curtis
05/24	02 10 DM			plant						11.10						Stan
	03:10 PM 10:05 AM									11,12	140	14.5	0	14.5	11.0	Stan
	10:05 AM 10:05 PM									13,14 15,16	149	14.5	0	14.5	11.0	Curtis S & FN
	07:20 AM									13,10						5 & FN
	03:40 PM		1.00							7,8						5 & FN
	01:55 PM	0.09	1.00	emerged	98.5	97.9	98.1	97.1	97.5	off						Curtis
	02:30 PM	0.07		emergeu	70.0	71.7	20.1	<i>,,</i> ,,	77.5	1,2						S & FN
	02:50 PM	0.07		2 leaf	98.7	98.2	98.1	97.2	97.5	1&2	150	14.0	148	12.5	10.5	Curtis
	04:25 PM		0.96							7,8						S & FN
06/15	08:50 AM									11,12						S & FN
06/17	05:55 PM									9,10						S & FN
	10:40 AM			5 leaf	98.4	97.9	97.8	97.0	97.2	off						Curtis
	01:45 PM	1.70		6 leaf	91.5	97.9	98.0	97.3	97.4	off						Curtis
06/28										1,2						Stan
	02:20 AM		1.53							7,8						S & FN
	08:00 PM	0.17		7 leaf	91.8	97.6	97.7	97.1	97.2	off						Curtis
	04:20 PM									9,10						S&FN
	01:20 AM									15,16 Blan 1						S&FN
	02:30 AM 02:30 AM									Plan 1 1,2				<u> </u>		S & FN S & FN
	02:30 AM 09:45 AM			9 leaf	69.1	96.6	98.0	97.5	97.5	1,2	141	15.0	0	14.5	10.5	S & FN Curtis
	11:30 AM		0.38	> icdi	02.1	20.0	20.0	11.5	11.3	15 & 16	1+1	15.0	0	14.3	10.5	FN
	08:35 PM		0.38							15,16				t	l	FN
	08:40 AM		0.00	10 leaf	46.8	88.5	98.3	97.7	97.8	3 & 6	150	15.0	148	13.0	11.0	Curtis
	05:40 AM		0.38							15,16						S & FN
	05:45 AM									Plan 2						S & FN
	05:45 AM									1,2						FN
07/17	02:50 PM		0.38							1,2						S & FN
07/17	03:15 PM			12 leaf	30.9	65.6	98.5	98.2	98.3	1 & 2	160	16.0	159	15.0	12.5	Curtis
	11:50 PM		0.38							15,16						S & FN
	09:55 AM			tassle	17.9	47.1	97.5	97.5	97.5	9 & 10	153	17.0	0	16.0	12.0	Curtis
	08:50 AM		0.38							15,16						FN
	01:45 PM			pollinate	10.2	34.4	97.6	97.7	97.9	15,16	150			16.0	14.0	Paul
	06:35 PM		0.38							15,16						FN
	03:55 AM	0.28	0.38	a - Warata	7.1	25.0	06.5	07.2	07.5	15,16	162	16.0	160	16.0	14.0	FN
	02:00 PM 01:00 PM	0.28	0.38	pollinate	7.1	25.9	96.5	97.3	97.5	3 & 6 15,16	163	16.0	160	16.0	14.0	Paul FN
	01:05 PM		0.58							Plan 3						S & FN
	01:05 PM									1,2						S & FN
	05:40 PM		0.38							7,8						S & FN
	02:30 PM	2.78	0.00	blister	98.1	93.7	95.9	97.6	97.8	off						Curtis
	09:40 AM			milk	95.6	87.5	92.7	96.6	96.8	off						Curtis
08/15	02:25 PM	3.74		milk	97.8	94.9	93.2	97.0	97.4	off						Curtis
08/21	10:25 AM	0.26		dough	97.0	94.3	92.2	96.6	96.9	off						Curtis
	11:10 AM									Corn						S & FN
	11:10 AM									1,2						S & FN
	03:40 PM		0.38							7,8						FN
	08:10 PM		0.38							7,8						FN
08/27	12:40 AM	0.27	0.38		07.0	05.2	00.0	06.0	07.2	7,8				I		S & FN
	11:40 AM	0.27		dent	97.9	95.3	90.0	96.8	97.2	off		ļ				Curtis
	09:50 AM 09:20 AM	0.12		¼ mat line	94.2	1.9	81.0	96.1	96.6	off						Curtis
	09:20 AM 01:50 PM		0.38	⅓ mat line						1,2 7,8						S & FN S & FN
	01:50 PM 02:45 PM		0.30	⅓ mat line ⅓ mat line	80.4	89.0	70.8	96.9	97.6	1&2	156	15.0	152	14.0	12.0	Curtis
	06:20 PM		0.38	. s mat mit	50.4	02.0	, 5.0	20.2	27.0	7,8	150	15.0	1.32		12.0	S & FN
	10:45 PM		0.38							7,8			1			5 & FN
	11:05 AM	1	0.00	⅓ mat line	82.8	84.7	59.3	96.3	97.1	off			1			Curtis
	01:50 PM	0.08		1/2 mat line	80.1	83.5	48.6	96.3	97.3	off		-			1	Curtis
	01:20 PM	0.45		1/2 mat line	66.7	78.4	44.2	96.0	97.2	off						Curtis
	10:40 AM									1,2						S & FN
	03:10 PM		0.38							7,8						S & FN
09/21	09:00 AM			⅔ mat line	52.6	73.0	39.3	95.2	96.6	4 & 5	158	16.5	154	15.5	12.5	Curtis
	03:10 PM										148		148			Curtis
	07:40 PM		0.38							7,8						S & FN
	11:20 AM	2.33							off							Curtis
	10:25 AM	1.19							off							Curtis
	02:30 PM	3.40		black layer	97.8	97.4	97.6	96.9	97.1	off				-		Curtis
	01:30 PM			black layer	98.1	97.6	97.8	97.3	97.4	off				ļ		Curtis
	01:35 PM			black layer	97.6	97.1	97.5	97.0	97.1	off				I		Curtis
10/27	10.05 135			harvest	07.0	06.2	06.0	06.1	06.5	- 27				-		Stan
10/20	10:05 AM			harvested	97.0	96.3	96.8	96.4	96.5	off						Curtis
	10:20 AM			harvested harvested	96.7 97.1	96.1	96.6	96.3	96.4	off						Curtis
11/07					7/.1	96.4	97.1	96.8	96.9	off		l		1		Curtis
11/07 11/13	01:25 PM	13 52	10.22	harvesteet		0.0	0.0	0.0	0.0	= 0.0"	Soil Moisture					Leon
11/07 11/13 Total		13.53 0.00 incl	10.33	nai vesteu	0.0	0.0	0.0	0.0	0.0	= 0.0"	Soil Moisture					Leon

Table 3: 2017 Field Data, "3 GPM" SDI Corn, 277 bu/ac, Spain

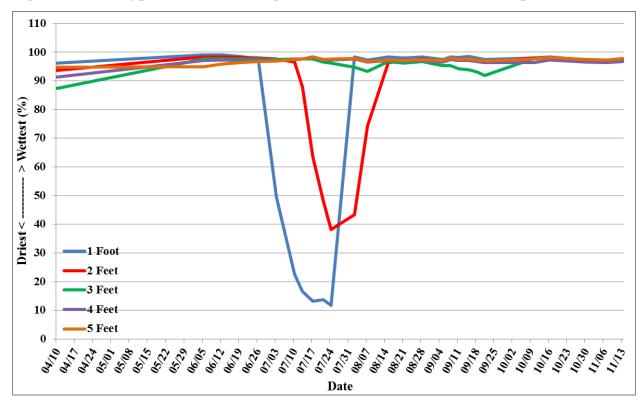
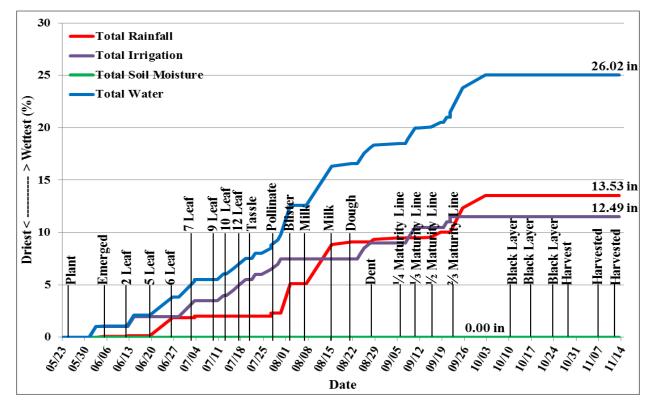


Figure 3: 2017 Gypsum Block Readings, "4 GPM" SDI Corn, 267 bu/ac, Spain

Figure 4: 2017 Growing Season Water Tracking, "4 GPM" SDI Corn, 267 bu/ac, Spain



Date	Time	Rainfall (inches)	Irrigation (inches)	Crop Irrigate	Filter Sta. Meter AF	Field Meter AF	Growth Stage	1 Foot		il Mositi 3 Feet	-	5 Feet	Zone Irrigating	Filter Sta. Meter GPM	Filter Sta. PSI	Meter	Zone Man. PSI	Zone Man. PSI	Source
03/27		0.33	(~	11000	21000	51000		51000				CDM			Curtis
04/03	10.05 434	2.06			55.50	07.14		06.1	02.6	07.2	01.2	047	<i>cc</i>						Curtis
04/10 04/24	10:05 AM	0.58 0.77		off	55.59	27.14		96.1	93.6	87.3	91.3	94.7	off						C & L Curtis
05/01		1.51																	Curtis
05/15		0.48																	Curtis
05/23 05/24		0.38					plant												Curtis Stan
	03:10 PM			start	55.59		plan						11,12						Stan
05/30	10:05 AM			cotton	56.81	27.14							13,14	149	14.5	0	14.5	11.0	Curtis
	10:05 PM			stop	57.14	27.14							9,10						S & FN
	07:20 AM 03:40 PM		1.00	start stop	57.14	27.14							1,2 7,8						S & FN S & FN
	01:55 PM	0.09			58.77	28.77	emerged	99.0	98.3	97.7	97.1	95.0	off						Curtis
	02:30 PM			start	58.77	28.77							1,2						S & FN
	02:50 PM 04:25 PM	0.07	0.96	stop	58.79 60.33	28.78 30.32	2 leaf	99.1	98.3	97.6	97.2	95.8	1 & 2 7,8	150	14.0	148	12.5	10.5	Curtis S & FN
	08:50 AM		0.90	start	60.33	30.32							11,12						S & FN
	05:55 PM			stop	61.88	30.32							9,10						S & FN
	10:40 AM	1.70			61.88	30.32	5 leaf	98.6	98.1	97.7	97.1 97.3	96.3	off						Curtis
06/26 06/28	01:45 PM	1.70		start	62.09 62.11	3032.00 30.32	6 leaf	97.7	98.0	97.7	97.5	96.8	off 1,2						Curtis Stan
	02:20 AM		1.53	stop	64.60	32.81							7,8						S & FN
	08:00 PM	0.17			64.60	32.81	7 leaf	49.5	97.6	97.5	97.1	96.9	off						Curtis
	04:20 PM 01:20 AM			start	64.60 66.20	32.81 32.81							9,10						S & FN S & FN
	01:20 AM 02:30 AM			stop Plan 1	66.20	32.81							15,16						S & FN S & FN
	02:30 AM			start	66.20	32.81							1,2						S & FN
	09:45 AM		0.50	cotton	67.71	33.60	9 leaf	22.5	96.6	97.7	97.5	97.4	15 & 16	141	15.0	0	14.5	10.5	Curtis
	11:30 AM 08:35 PM		0.50	into corn into corn									15,16 15,19				<u> </u>		FN FN
	08:40 AM		0.50	corn	69.57	34.70	10 leaf	16.5	87.9	97.6	97.6	97.6	3 & 6	150	15.0	148	13.0	11.0	Curtis
07/15	05:40 AM		0.50		70.80	35.15							15,16						S & FN
	05:45 AM			Plan 2	70.80	35.15		-				-	Plan 2						S & FN
	05:45 AM 02:50 PM		0.50	start into corn	70.80	35.15							1,2 1,2						FN S & FN
	03:15 PM		0.50	corn	72.47	36.05	12 leaf	13.2	63.4	97.7	98.3	98.3	1 & 2	160	16.0	159	15.0	12.5	Curtis
	11:50 PM		0.50	into corn									15,16						S & FN
	09:55 AM		0.50	cotton	75.13	37.82	tassle	13.7	48.3	96.5	97.5	97.5	9 & 10	153	17.0	0	16.0	12.0	Curtis
	08:50 AM 01:45 PM		0.50	into corn cotton	77.32	38.72	pollinate	11.8	38.2	96.2	97.2	97.7	15,16 15 & 16	150			16.0	14.0	FN Paul
	06:35 PM		0.50	into corn	11.52	50.72	polinitie	11.0	50.2	20.2	77.2	21.1	15,16	150			10.0	11.0	FN
	03:55 AM		0.50	into corn									15,16						FN
	02:00 PM 01:00 PM	0.28	0.50	corn	79.50	39.92	pollinate	12.2	33.9	94.8	97.3	97.5	3 & 6 15,16	163	16.0	160	16.0	14.0	Paul FN
	01:00 PM 01:05 PM		0.50	cotton Plan 3	80.79	40.51		-				-	Plan 3						S & FN
	01:05 PM			start	80.79	40.51							1,2						S & FN
	05:40 PM		0.50	stop	81.66	41.35							7,8						S & FN
	02:30 PM 09:40 AM	2.78		81.724 81.658	81.66 81.66	41.35 41.35	blister milk	98.4 97.3	43.4 74.3	94.8 93.4	97.7 96.6	97.8 96.8	off off						Curtis Curtis
	02:25 PM	3.74		81.658	81.66	41.35	milk	98.4	96.3	96.7	97.1	97.3	off						Curtis
	10:25 AM	0.26		81.658	81.66	41.35	dough	98.0	96.9	96.2	96.9	97.0	off						Curtis
	11:10 AM			Corn	81.66	41.35							Corn						S & FN
	11:10 AM 03:40 PM		0.50	start into 1,2	81.66	41.35							1,2 7,8						S & FN FN
	03:40 PM		0.50	into 1,2				<u> </u>				<u> </u>	7,8						FN
08/27	12:40 AM		0.50	stop	84.19	43.85							7,8				I		S & FN
	11:40 AM	0.27			84.19	43.85	dent	98.3	97.6	96.8	97.1	97.4	off						Curtis
	09:50 AM 09:20 AM	0.12		start	84.19 84.19	43.85 43.85	¼ mat line	97.5	96.9	95.3	96.6	97.0	off 1,2						Curtis S & FN
09/08	01:50 PM		0.50	into 1,2			⅓ mat line						1 & 2						S & FN
	02:45 PM		0.5-	corn	85.05	44.71	⅓ mat line	98.3	97.6	95.3	97.5	98.0	1 & 2	156	15.0	152	14.0	12.0	Curtis
	06:20 PM 10:45 PM		0.50	into 1,2 stop	86.67	46.31							7,8 7,8				<u> </u>		S & FN S & FN
	10:45 PM 11:05 AM		0.50	stop	86.67	46.31	⅓ mat line	98.2	97.1	94.2	97.0	97.5	7,8 off				1	-	Curtis
09/15	01:50 PM	0.08			86.67	46.31	1/2 mat line	98.5	97.5	93.9	97.1	97.7	off						Curtis
	01:20 PM	0.45			86.67	46.31	½ mat line	97.9	97.0	93.2	96.8	97.3	off				<u> </u>		Curtis
	10:40 AM 03:10 PM		0.50	start into 1,2	86.67	46.31							1,2 7,8				1		S & FN S & FN
	09:00 AM		0.50	corn	88.05	47.68	⅔ mat line	97.5	96.4	91.9	96.3	96.9	4 & 5	158	16.5	154	15.5	12.5	Curtis
09/21	03:10 PM			corn	88.22	47.85								148		148			Curtis
	07:40 PM	2 22	0.50	stop	88.35	47.97							7,8				l		S & FN Curtis
	11:20 AM 10:25 AM	2.33		88.346 88.346	47.97 47.97								off off						Curtis Curtis
	02:30 PM	3.40		88.346	47.97		black layer	98.0	97.9	97.8	96.3	97.7	off						Curtis
	01:30 PM			88.346	47.97		black layer	98.3	98.2	98.1	97.2	98.1	off						Curtis
10/23 10/27	01:35 PM			88.346	47.97		black layer harvest	97.8	97.8	97.6	96.9	97.8	off						Curtis Stan
	10:05 AM			88.346	47.97		harvested	97.5	97.2	97.3	96.6	97.5	off						Curtis
	10:20 AM			88.346	47.97		harvested	97.2	96.7	97.0	96.3	97.3	off						Curtis
11/07		-		88.346	47.97		harvested	97.2	96.9	97.5	96.7	97.8	off						Curtis
11/13	01:25 PM																		
11/13 Total	01:25 PM noisture is (13.53	12.49					0.0	0.0	0.0	0.0	0.0	= 0.0"	Soil Moisture					Leon

Table 4: 2017 Field Data, "4 GPM" SDI Corn, 267 bu/ac, Spain

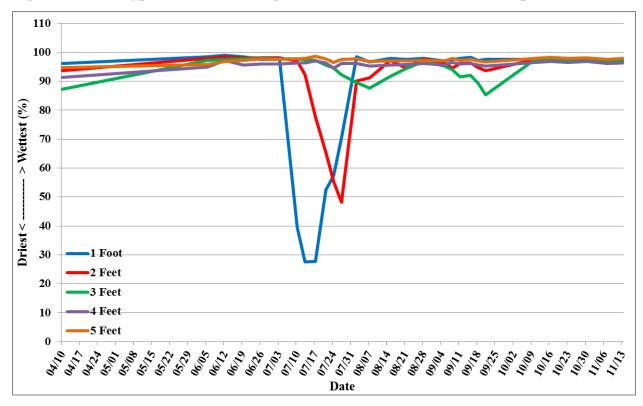
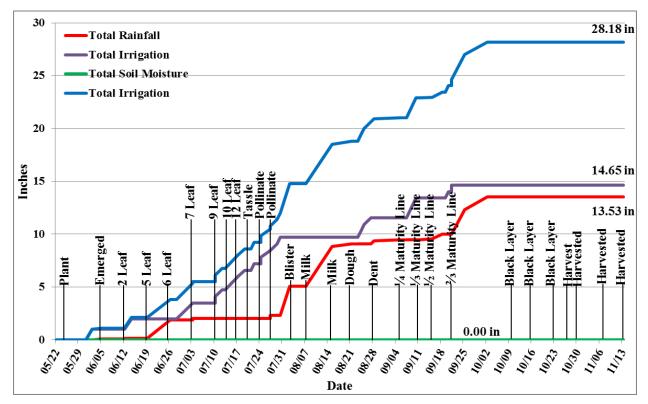


Figure 5: 2017 Gypsum Block Readings, "5 GPM" SDI Corn, 265 bu/ac, Spain

Figure 6: 2017 Growing Season Water Tracking, "5 GPM" SDI Corn, 265 bu/ac, Spain



Date	Time	Rainfall	Irrigation	Crop	Filter Sta.	Field	Growth			il Mositu			Zone	Filter Sta.	Filter	Field Meter	Zone	Zone	Source
03/27		(inches) 0.33	(inches)	Irrigate	Meter AF	Meter AF	Stage	1 Foot	2 Feet	3 Feet	4 Feet	5 Feet	Irrigating	Meter GPM	Sta. PSI	GPM	Man. PSI	Man. PSI	Curtis
04/03		2.06																	Curtis
	10:05 AM	0.55		off	55.59	27.14		96.1	93.6	87.3	91.3	94.7	off						C & L
04/24 05/01		0.77																	Curtis Curtis
05/01		0.48																	Curtis
05/23		0.38																	Curtis
05/24							plant												Stan
	03:10 PM			start	55.59	27.4.4							11,12	1.10				11.0	S & FN
05/30 05/30	10:05 AM 10:05 PM			cotton stop	56.81 57.14	27.14 27.14							13,14 9,10	149	14.5	0	14.5	11.0	Curtis S & FN
	07:20 AM			start	57.14	27.14							1,2						S & FN
06/02	03:40 PM		1.00	stop									7,8						S & FN
	01:55 PM	0.09			58.77	28.77	emerged	98.4	98.0	97.2	95.0	95.8	off						Curtis
	02:30 PM 02:50 PM	0.07		start	58.77 58.79	28.77 28.78	2 leaf	99.0	98.5	97.6	97.2	96.8	1,2 1 & 2	150	14.0	148	12.5	10.5	S & FN Curtis
	02:30 PM 04:25 PM	0.07	0.96	corn stop	60.33	30.32	2 leai	99.0	96.5	97.0	91.2	90.8	7,8	150	14.0	140	12.5	10.5	S & FN
	08:50 AM			start	60.33	30.32							11,12						S & FN
	05:55 PM			stop	61.88	30.32							9,10						S & FN
06/19	10:40 AM	1.70			61.88	30.32	5 leaf	98.4	98.1	97.8	95.7	97.3	off						Curtis
06/26	01:45 PM	1.70		start	62.09 62.11	30.32 30.32	6 leaf	97.5	98.2	97.9	96.0	97.7	off 1,2						Curtis Stan
	02:20 AM		1.53	stop	64.60	32.81							7,8						S & FN
07/03	08:00 PM	0.17			64.60	32.81	7 leaf	97.6	98.1	97.7	95.9	97.5	off						Curtis
	04:20 PM			start	64.60	32.81							9,10						S & FN
	01:20 AM 02:30 AM			stop Plan 1	66.20 66.20	32.81 32.81							15,16						S & FN S & FN
	02:30 AM 02:30 AM			start	66.20	32.81							1,2						S & FN S & FN
	09:45 AM			cotton	67.71	33.60	9 leaf	39.5	97.0	97.8	96.3	97.8	15 & 16	141	15.0	0	14.5	10.5	Curtis
	11:30 AM		0.62	nto corr									15,16						FN
	08:35 PM		0.62	nto corr		24.70	101 6	27.5	02.2	07.4	06.1	07.0	15,19	150	15.0	140	12.0	11.0	FN
	08:40 AM 05:40 AM		0.62	corn	69.57 70.80	34.70 35.15	10 leaf	27.5	92.3	97.4	96.4	97.9	3 & 6	150	15.0	148	13.0	11.0	Curtis S & FN
-	05:40 AM		0.02	Plan 2	70.80	35.15							Plan 2						5 & FN
	05:45 AM			start	70.80	35.15							1,2						FN
_	02:50 PM		0.62	nto corr									1,2						S & FN
	03:15 PM		0.62	corn	72.47	36.05	12 leaf	27.7	77.7	97.3	97.1	98.7	1 & 2	160	16.0	159	15.0	12.5	Curtis
	11:50 PM 09:55 AM		0.62	nto corr cotton	75.13	37.82	tassle	52.5	65.4	95.6	96.3	97.8	15,16 9 & 10	153	17.0	0	16.0	12.0	S & FN Curtis
07/22	08:50 AM		0.62	nto corr		57.02	cussie	0210	05.1	75.0	70.5	21.0	15,16	100	17.0	0	10.0	12.0	FN
07/24	01:45 PM			cotton	77.32	38.72	pollinate	57.5	55.2	94.5	94.5	96.5	15 & 16	150			16.0	14.0	Paul
	06:35 PM		0.62	nto corr									15,16						FN
	03:55 AM 02:00 PM	0.28	0.62	nto corr corn	79.50	39.92	pollinate	70.4	48.2	92.2	96.1	97.6	15,16 3 & 6	163	16.0	160	16.0	14.0	FN Paul
	02:00 PM 01:00 PM	0.28	0.62	cotton	80.79	40.51	pomnate	70.4	40.2	92.2	90.1	97.0	15,16	105	10.0	100	10.0	14.0	Faul
	01:05 PM			Plan 3									Plan 3						S & FN
	01:05 PM			start	80.79	40.51							1,2						S & FN
	05:40 PM 02:30 PM	2.78	0.62	stop	81.66 81.66	41.35 41.35	blister	98.5	90.2	89.6	96.2	97.8	7,8 off						S & FN Curtis
	02:30 FM 09:40 AM	2.70			81.66	41.35	milk	96.7	90.2	87.7	95.3	96.8	off						Curtis
	02:25 PM	3.74			81.66	41.35	milk	98.0	97.2	91.8	95.6	97.1	off						Curtis
	10:25 AM	0.26			81.66	41.35	dough	97.5	94.6	94.4	95.8	97.1	off						Curtis
_	11:10 AM			Corn	81.66	41.35							Corn						S & FN
	11:10 AM 03:40 PM		0.62	start into 1,2	81.66	41.35							1,2 7,8						S & FN FN
08/25	08:10 PM		0.62	into 1,2									7,8						FN
08/27	12:40 AM		0.62	stop	84.19	43.85							7,8						S & FN
	11:40 AM	0.27		84.19	84.19	43.85	dent	98.0	97.8	96.9	96.2	97.3	off						Curtis
	09:50 AM 09:20 AM	0.12		84.19 start	84.19 84.19	43.85 43.85	1/4mat ln	97.0	96.4	95.3	95.7	97.0	off 1.2						Curtis S & FN
	09:20 AM 01:50 PM		0.62	start into 1,2		+3.03	⅓ mat line						1,2 1 & 2						S & FN
09/08	02:45 PM			corn	85.05	44.71	⅓ mat line	97.6	94.5	94.1	96.5	98.0	1&2	156	15.0	152	14.0	12.0	Curtis
	06:20 PM		0.62	into 1,2									7,8						S & FN
	10:45 PM		0.62	stop	86.67	46.31	14	08.0	061	01.5	06.0	07.2	7,8						S & FN
	11:05 AM 01:50 PM	0.08			86.67 86.67	46.31 46.31	⅓ mat line ½ mat line	98.0 98.3	96.1 96.4	91.5 92.1	96.0 96.1	97.3 97.6	off off						Curtis Curtis
	01:20 PM	0.45			86.67	46.31	1/2 mat line	97.3	94.8	89.3	95.6	97.0	off						Curtis
09/19	10:40 AM			start	86.67	46.31							1,2						S & FN
	03:10 PM		0.62	into 1,2	00.77			05 -				0.4 -	7,8	4.67			15 -		S & FN
-	09:00 AM 03:10 PM			corn	88.05	47.68	⅔ mat line	97.5	93.6	85.3	95.2	96.7	4 & 5	158	16.5	154	15.5	12.5	Curtis
	03:10 PM 07:40 PM		0.62	corn stop	88.22 88.35	47.85 47.97							7,8	148		148			Curtis S & FN
	11:20 AM	2.33	0.02	JUSP	88.346	47.97							off						Curtis
10/02	10:25 AM	1.19			88.346	47.97							off						Curtis
	02:30 PM	3.40			88.346	47.97	black layer	97.5	97.5	97.6	96.5	97.9	off						Curtis
	01:30 PM 01:35 PM				88.346 88.346	47.97 47.97	black layer black layer	97.8 97.4	97.9 97.5	98.0 97.4	96.9 96.6	98.3 98.0	off off		ļ				Curtis Curtis
10/23	01.53 PM				00.340	47.97	harvest	91.4	97.3	71.4	90.0	96.0	011						Stan
	10:05 AM				88.346	47.97	harvested	97.6	97.6	97.6	96.8	98.1	off						Curtis
11/07	10:20 AM				88.346	47.97	harvested	97.0	96.9	96.8	96.1	97.5	off						Curtis
-	01:25 PM	10			88.346	47.97	harvested	97.2	97.1	97.1	96.4	97.9	off	0.034					Curtis
Total Net soil	moisture is	13.53	14.65					0.0	0.0	0.0	0.0	0.0	= 0.0"	Soil Moisture					Leon
				, and pe	t soil moist	ure (0.00 in) is total wat	er (28.1	8 in).										+
-	ers in red a	-						, -i	,.										

Table 5: 2017 Field Data, "5 GPM" SDI Corn, 265 bu/ac, Spain

2017 Harvest Results, SDI Corn, Spain

The 3 GPM field produced a 277 bushel per acre corn yield. Irrigation totaled 10.33 inches. Production in the 4 GPM field was 267 bushels per acre. Seasonal irrigation totaled 12.49 inches. Corn yield was 265 bushels per acre for the 5 GPM field. Irrigation totaled 14.65 inches. There was no pre-season irrigation. The 3 GPM field produced 10 more bushels per acre than the 4 GPM field. Irrigation was 2.16 inches more for the 4 GPM field. The 3 GPM field produced 12 more bushels per acre than the 5 GPM with 4.32 less inches of irrigation. The 4 GPM yield was 2 more bushels per acre than that from 5 GPM field with 2.16 less inches of irrigation.

Corn production was 26.82 bushels (1501lb.) per inch of irrigation in the 3 GPM field compared to 21.38 bushels (1197lb.) in the 4 GPM and 18.09 bushels (1013lb.) from the 5 GPM field. Production from each inch of irrigation, rainfall and net soil water that totaled 23.86 inches was 11.61 bushels (650lb.) per acre in the 3 GPM field. Irrigation, rainfall and net soil water totaled 26.02 inches in the 4 GPM field where production was 10.26 bushels (574lb.) per inch. In the 5 GPM field, irrigation, rainfall and net soil water totaled 28.18 inches where production was 9.40 bushels (526lb.) per inch of total water.

Crop production costs were \$3.75 per acre more for the 4 GPM field than for the 3 GPM from increased irrigation expenses. At \$3.63 per bushel, the 10 bushels per acre increased corn yield in the 3 GPM field amounts to \$36.30 more per acre than from the 3 GPM field. The 3 GPM field's net gain is \$40.05 per acre with 2.16 inches less irrigation used compared to production from the 4 GPM field. At \$3.63 per bushel, the 12 bushel per acre increased yield from the 3 GPM field compared to the 5 GPM amounts to \$43.56 per acre. Crop production costs were \$15.21 per acre more for the 5 GPM field. The 3 GPM fields' net gain compared to the 5 GPM field is \$58.77 per acre with 4.32 less inches of irrigation. Value of the 2 additional bushels produced in the 4 GPM field compared to the 5 GPM field is \$7.26. Production Costs were \$11.46 more for the 5 GPM field than the 4 GPM from increased irrigation. Net gain for the 4 GPM field is \$18.72 per acre with 2.16 inches less irrigation. Net return from the 3 GPM field was \$567.59 per acre compared to \$527.64 from the 4 GPM field and \$508.82 from the 5 GPM field. Net return from each inch of irrigation is \$54.96 for the 3 GPM field compared to \$42.24 from the 4 GPM and \$34.73 for the 5 GPM field. A summary of the demonstration results are shown in table 6 and Appendix B.

GPM	Irrigation (in)	Total Water (in)	Production		Gross Crop Value @ \$3.63/bu			
			bu/ac	lb/ac-in of	per acre (\$)	Acre-inch of	Acre-inch of	
				Irrigation		Irrigation (\$)	Total Water	
3 GPM	10.33	23.86	277	1501	\$1,005.51	\$97.34	\$42.14	
4 GPM	12.49	26.02	267	1197	\$969.21	\$77.60	\$37.25	
5 GPM	14.45	28.18	265	1013	\$961.95	\$65.66	\$34.14	
All fields include 0.00 inches of soil water within 5 feet of soil, only rainfall and irrigation.								

Table 6: 2017 SDI Corn Demonstration Results, Spain

2017 LEPA Center Pivot and SDI Harvest Results, Spain

The 3 GPM LEPA field produced a 260 bushel per acre corn yield; irrigation totaled 11.38 inches. Production in the 3 GPM SDI field was 277 bushels per acre; seasonal irrigation totaled 10.33 inches. Corn yield was 270 bushels per acre for the 4 GPM LEPA field; irrigation totaled 13.67 inches. Yield in the 4 GPM SDI field was 267 bushels per acre; irrigation was 12.49 inches. Production in the 5 GPM LEPA field was 270 bushels per acre; irrigation was 15.94 inches. Production in the 5GPM SDI field was 265 bushels per acre; irrigation totaled 14.65 inches. There was no pre-season irrigation.

The 3 GPM SDI field produced 17 more bushels per acre than the 3 GPM LEPA field; irrigation was 1.05 inches less. The 4 GPM LEPA field produced 3 more bushels per acre than the 4 GPM SDI with 1.18 more inches of irrigation. The 5 GPM LEPA yield was 5 more bushels per acre than that from 5 GPM SDI field with 1.29 additional inches of irrigation.

Corn production was 22.84 bushels (1279lb.) per inch of irrigation in the 3 GPM LEPA field compared to 26.81 bushels (1501 lb.) in the 3 GPM SDI field. Yield was 21.61 bushels (1210 lb.) from the 4 GPM LEPA compared to 21.38 bushels (1197 lb.) from the 4 GPM SDI field. The 5 GPM LEPA field produced 16.94 bushels (948 lb.) from each inch of irrigation. The 5 GPM SDI produced 18.09 bushels (1013 lb.) per inch.

Production from each inch of irrigation, rainfall, and net soil water that totaled 24.00 inches was 10.83 bushels (606 lb.) per acre in the 3 GPM LEPA field. Irrigation, rainfall, and net soil water totaled 23.86 inches in the 3 GPM SDI field where production was 11.61 bushels (650 lb.) per inch. In the 4 GPM LEPA field, irrigation, rainfall, and net soil water totaled 26.29 inches where production was 10.27 bushels (575 lb.) per inch of total water. Irrigation, rainfall, and net soil water totaled 26.02 inches in the 4 GPM SDI field where production was 10.26 bushel (574 lb.) from each inch. In the 5 GPM LEPA field. Irrigation, rainfall, and soil water totaled 28.56 inches from which production was 9.45 bushels (529 lb.) per inch. From 28.18 inches of irrigation, rainfall, and soil water, production in the 5 GPM SDI field was 9.40 (526 lb.) from each inch.

Crop production costs were \$9.72 per acre more for the 3 GPM SDI field than the 3 than for the 3 GPM LEPA from fertilizer and harvest expenses. At \$3.44 per bushel, the 17 bushels per acre increased corn yield in the 3 GPM SDI field amounts to \$61.71more per acre than from the 3 GPM LEPA field. The 3 GPM SDI field's net gain is \$51.92 per acre with 1.05 inches less irrigation used compared to the 3 GPM LEPA field.

At \$3.63 per bushel, the 3 bushel per acre increased yield from the 4 GPM LEPA field compared to the 4 GPM SDI amounts to \$10.89 per acre. Crop production costs were \$9.24 per acre more for the 4 GPM LEPA field. The 4 GPM LEPA field's net gain compared to the 4 GPM SDI field is \$1.65 per acre with 1.18 additional inches of irrigation. Value of the 5 additional bushels produced in the 5 GPM LEPA field compared to the 5 GPM SDI field is \$18.15. Production costs were \$12.86 more for the 5 GPM LEPA field than the 5 GPM SDI. Net gain for the 5 GPM LEPA field is \$5.29 per acre with 1.29 inches more irrigation.

Net return from the 3 GPM LEPA field was \$515.67 per acre compared to \$567.59 from the 3 GPM SDI field. Net return from the 4 GPM LEPA field was \$528.22 and \$530.20 from the 4 GPM SDI field. From the 5 GPM fields, net return was \$514.14 from LEPA and \$510.06 from SDI.

Stan Spain's 2017 Moore County LEPA Corn Demonstration

2017 Planting and Crop Information, LEPA Corn, Spain

Stan Spain strip tilled and planted 55 acres of corn in the south half of the east circle of the south half of section 47 for his "3, 4, 5 GPM" demonstration. The 55 acres were equally divided for his 3, 4, and 5 GPM fields. Each field was 18.33 acres. Ninety to 150 degrees was Spain's 3 GPM field, 150 to 210 degrees was the 5 GPM field, and 210 to 270 degrees was the 4 GPM field. Spain planted each "3, 4, 5 GPM" field to the Pioneer P1197AMX hybrid. Seeding rate was 32,000 seeds per acre for the 3 GPM, 4 GPM, and 5 GPM fields. Center pivot travel speed was by Pivotrac. The speed control prescription moved the center pivot to apply 1.10 inches on the 3 GPM field in 20.50 hours, 1.49 inches on the 4 GPM field in 27.80 hours, and 1.85 inches on the 5 GPM field in 34.60 hours. The north 55 acres were irrigated in 83.30 hours. Seasonal water meter readings averaged 445 GPM. Irrigation was with Senningers' LDN LEPA bubbler applicator with drops spaced 30 inches apart. Planting and crop information for "Spain 3 GPM", "Spain 4 GPM", and "Spain 5 GPM" LEPA are shown in the Table 7 below.

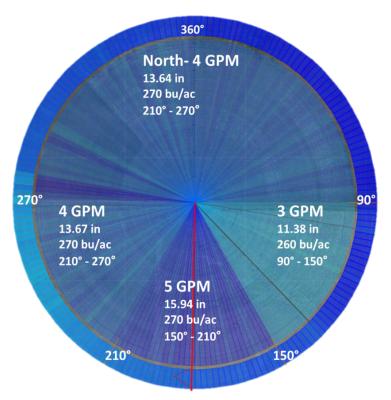
3 GPM Demons	tration Site: 90-150 deg	rees		
Planted	May 25	Harvested	October 28	
Hybrid Pioneer P1197AM		Seeding Rate	32,000	
Row Width 30 inches		Tillage	Strip Till	
No. Acres	18.33	GPM per acre	3.00	
Total Water	Total Water 24.00 inches		Sherman Clay Silty Loam	
Irrigation 11.38 inches		Insecticide	Comite, Warhawk, Cide Trak	
4 GPM Demons	tration Site: 210-270 deg	grees		
Planted	May 25	Harvested	October 28	
Hybrid	Pioneer P1197AMT	Seeding Rate	32,000	
Row Width	30 inches	Tillage	Strip Till	
No. Acres	18.33	GPM per acre	4.00	
Total Water	26.29 inches	Soil Type	Sherman Clay Silty Loam	
Irrigation	13.67 inches	Insecticide	Prevathon, Warhaw, Rifle	
5 GPM Demons	tration Site: 150-210 deg	grees		
Planted	May 25	Harvested	October 28	
Hybrid	Pioneer P1197AMT	Seeding Rate	32,000	
Row Width	30 inches	Tillage	Strip Till	
No. Acres	18.33	GPM per acre	5.00	
Total Water	28.56 inches	Soil Type	Sherman Clay Silty Loam	
Irrigation	15.94 inches	Insecticide	Prevathon, Warhaw, Rifle	

Table 7: 2017 Planting and Crop Information, LEPA Corn, Stan Spain

2017 Irrigation Intensity Map, LEPA Corn, Spain

A center pivot travel speed prescription was written and loaded on Pivotrac's control monitor for 6.90% to apply 1.10 inches of irrigation in a seven day revolution in the 3 GPM field from 90 to 150 degrees in the circle. At 150 degrees in the rotation, travel speed was reduced to 4.10% to apply 1.85 inches in the 5 GPM field from 150 to 210 degrees. Travel speed was increased to 5.10% beginning at 210 to 270 degrees to apply 1.49 inches in the 4 GPM field. The north half of the circle from 270 to 90 degrees continued to be irrigated at the 4 GPM per acre capacity in a 168 hour weekly revolution.

Figure 7: 2017 Irrigation Intensity Map, LEPA Corn, Spain



2017 Soil Water Profile and Growing Season Rainfall, LEPA Corn, Spain

"3 GPM" LEPA Demonstration Site

Preseason soil water was good at 1, 2, 3, 4, and 5 feet at planting. Weekly gypsum block readings indicate the crop used more than irrigation and rainfall provided and removed stored water from 1 and 2 feet by mid-July at tassel growth stage. Plant roots developed more into 2 feet during July mostly depleting the plant root zone at the 2 feet depth. Significant soil water was used from 1 and 2 feet plus irrigation and rainfall during July. Weekly soil water sensor readings showed limited to no soil water use from 3, 4, and 5 feet in the root zone. Soil water used from 1 and 2 feet in July was replaced by late season rainfall resulting in a full soil profile at 1, 2, 3, 4, and 5 feet at harvest in October indicating no net soil water was used in producing the crop. Soil moisture sensors showed the crop had adequate soil water during the growing season. The crop was produced in Sherm silty clay loam that can store

approximately 2.00 inches of available water per foot for potential crop use. Rainfall from planting until grain black layer totaled 12.62 inches.

"4 GPM" LEPA Demonstration Site

Soil water was good at 1, 2, 3, 4, and 5 feet prior to and at planting. Soil moisture sensors show plant roots began using water from 1 foot in the root zone at the 9 leaf growth stage in mid-July, in addition to rainfall and irrigation. Plant roots grew rapidly into 2 and 3 feet in July at tassel and pollination, basically depleting stored soil water at 1, 2, and 3 feet in addition to rainfall and irrigation. Weekly sensor readings showed no soil water was used from 4 feet in producing the crop. The seasonal soil water readings at 5 feet were typical for caliche soil that has no real contribution in storing water to produce any crop. The sensor at 5 feet indicated no water was available or used from 5 feet in the soil profile. Weekly gypsum block readings show the crop had adequate soil moisture during the growing season. Late season rainfall in September and October that totaled 3.85 inches contributed to producing the crop. A total of 12.62 inches of rainfall was recorded from planting through black layer. The crop was produced in Sherm silty clay loam that holds approximately 2.00 inches available water per foot for potential crop use.

"5 GPM" LEPA Demonstration Site

Soil water sensor readings in April and May prior to planting showed approximately 25% of full profile available water at 3 feet, 45% at 4 feet, and 75% at 5 feet. Following sensor readings indicated the 3.56 inches of rainfall filled the profile to capacity by planting. Therefore, beginning soil water was good at 1, 2, 3, 4, and 5 feet at planting. Soil moisture sensors showed plant roots began to remove water from 1 foot and 2 feet in July during pollination. Roots continued to use stored soil water from 1 and 2 feet in addition to irrigation and rainfall during July until both feet were basically depleted. The sensors showed no soil water was used from 3, 4, and 5 feet producing the crop. Sensors showed rainfall in September and October that totaled 3.85 inches refilled that used earlier in the season from 1 and 2 feet. Sensor readings at harvest were similar to the ones at planting, indicating no net soil water was used producing the crop. The preseason sensor readings showed how to utilize rainfall rather than pre-water to provide essential soil water during the primary water use growth stages when rainfall and irrigation was not enough. Weekly gypsum block moisture sensors showed the crop had sufficient available soil water during the antire growing season. Total rainfall was 12.62 inches. Irrigation totaled 15.94 inches. The crop was produced in Sherm silty clay loam soil that holds 2.00 inches of available water per foot for potential crop use.

Table 8: 2017 Monthly Rainfall Data, LEPA Corn, Spain

GPM	June (in)	July (in)	August (in)	September (in)	October (in)	Total (in)
3, 4, 5	1.70	0.53	6.54	2.77	1.08	12.62

2017 Growing Season Water Tracking, LEPA Corn, Spain

The district tracked total water and crop growth throughout the growing season using rain gauges, water meters, and both gypsum blocks and AquaSpy® soil moisture sensors. One set of five gypsum block soil

moisture sensors was installed at 1, 2, 3, 4, and 5 feet. An AquaSpyTM soil moisture probe was installed down to four feet in the root zone at one location to monitor soil water levels in the "3 GPM" field. Another set of the same type of sensors was installed in each "4 GPM" and "5 GPM" field. Both the gypsum block sensors and the soil probe were installed in close proximity to each other in each field. Gypsum blocks, water meters, rain gauges, and crop growth were read, recorded, and utilized weekly by district personnel. Each AquaSpy® probe was installed following crop emergence. A 24/7 Aquaspy probe website showed soil moisture at 4 inch increments to 48 inches and monitored plant root growth. The website listed all Aquaspy soil probes in the "3, 4, 5, GPM" project and was available to all cooperators and district personnel. Another 24/7 Pivotrac website tracked each center pivot system and monitored and controlled irrigation. Each center pivot travel speed prescription was written to apply 1.10 inches ("3 GPM"), 1.49 inches ("4 GPM"), and 1.85 inches ("5 GPM") and was managed from the Pivotrac website. The cooperating grower and the district "3, 4, 5 GPM" Project Leader collectively monitored, controlled, and managed irrigation from the Pivotrac website.

Following this paragraph, a series of graphs and tables shows weekly gypsum block readings for the season; growing season water, including rainfall, irrigation, and soil moisture at various growth stages; and the order of irrigation and rainfall events for each "3, 4, 5, GPM" field. "Water Summary," as shown on the graph for growing season water, was the sum of seasonal irrigation, rainfall, and net soil water. Graphs and tables for the 3 GPM acres are shown first, followed by the same illustrations for each 4 GPM and 5 GPM field.

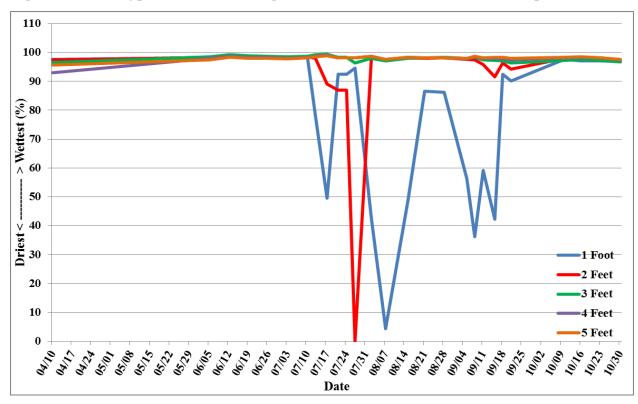
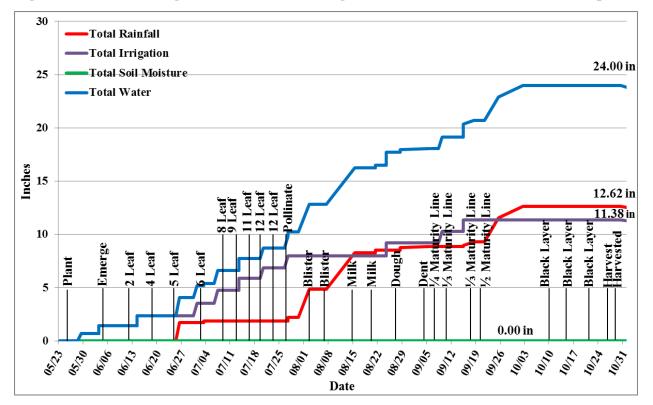


Figure 8: 2017 Gypsum Block Readings, "3 GPM" LEPA Corn, 260 bu/ac, Spain

Figure 9: 2017 Growing Season Water Tracking, "3 GPM" LEPA Corn, 260 bu/ac, Spain



		Rainfall	Irrigation	Water	Hour	Growth		So	il Moista	ıre		Pivot	a	Well	
Date	Time	(inches)	(inches)	Meter	Meter	Stage	1 Foot			4 Feet	5 Feet	Position	Crop Irrigate	(GPM)	Source
03/27	10:40AM	0.33		278.72								290			Curtis
04/03	10:25AM	2.02										290			Curtis
04/10	4:40PM			278.72	3592.8		97.6	97.4	96.6	92.9	95.6	290			C & L
04/24	11:30AM	0.75		278.72								290			Curtis
05/01	11:40AM	1.38		278.72								290			Curtis
05/15	9:40AM	0.48		278.72								274			Curtis
05/23	11:50AM	0.36		278.72								259			Curtis
05/25						plant						move dry			Stan
05/27	03:45 PM			278.72		-						278	start		Pivotrac
05/27	04:00 PM			278.74								270	into 4	445	Pivotrac
05/28	06:30 AM			279.93								210	into 5	445	Pivotrac
05/28	07:30 PM			281.00								150	into 3	445	Pivotrac
05/29	08:45 AM		0.71	282.10								90	into N	445	Pivotrac
05/30	11:05 AM			284.44	3668.3							329	N	448	Curtis
05/30	10:15 PM			285.19								278	stop	445	Pivotrac
05/31	08:35 AM			285.35	3679.6							278	off	-	Curtis
06/02	06:40 AM			285.35								278	start	445	Pivotrac
06/02	08:30 AM			285.34								270	into 4	445	Pivotrac
06/02	09:20 PM			286.40								210	into 5	445	Pivotrac
06/03	10:30 AM			287.48								150	into 3	445	Pivotrac
06/03	11:25 PM		0.70	288.54								90	into N	445	Pivotrac
06/05	12:45 PM		0.70	291.94	3757.8	emerge	98.1	98.3	98.5	97.9	97.5	278	N	442	Curtis
06/05	01:15 PM			291.66	5151.0	emerge	70.1	70.5	70.5	,,,,	71.5	270	N	445	Pivotrac
06/12	09:20 AM			291.97	3758.0	2 leaf	98.8	99.0	99.2	98.7	98.3	271	off	-+-5	Curtis
06/12	11:30 AM			291.97	5750.0	2 1001	70.0	77.0	<i>)).</i>	20.7	70.5	277	start		Pivotrac
06/12	01:25 PM			292.14	3759.7	2 leaf	98.8	99.0	99.2	98.7	98.3	271	N	452	Curtis
06/13	01:50 PM			291.86	5157.1	2 1041	70.0	77.0	<i>)).</i> 2	70.7	70.5	270	into 4	445	Pivotrac
06/13	07:25 AM			293.30								210	into 4	445	Pivotrac
06/13	12:45 AM			294.73								150	into 3	445	Pivotrac
06/14	06:30 PM		0.95	296.19								90	into S	445	Pivotrac
06/16	09:00 PM		0.75	300.36								277	stop	-++5	Pivotrac
	11:00 AM			300.67	3863.3	4 leaf	98.5	98.6	98.8	98.3	98.0	277	off		Curtis
	02:30 PM			300.69	3003.3	4 1041	90.5	90.0	90.0	90.5	90.0				
06/25	02.50 PM			300.09								277 270	start into 4		Pivotrac Pivotrac
	11:30 PM			500.55											
06/25	02:15 PM	1 70		201.41	3872.9	5 loof	98.3	98.5	98.7	98.3	08.0	250 250	stop		Pivotrac
06/26		1.70		301.41	3012.9	5 leaf	90.3	70.J	90./	70.3	98.0		off		Curtis Pivotrac
06/28	05:00 PM			202.40								250	start	115	Pivotrac
06/29	08:35 AM			302.40								210	into 5	445	
06/30	05:20 AM		1 17	304.11								150	into 3	445	Pivotrac
07/01	02:40 AM		1.15	305.86								90	into N	445	Pivotrac
07/03	05:25 PM	0.14		311.03	2007 1	(1.6	00.1	00.2	00.7	00.0	07.0	270	into 4	445	Pivotrac
07/03	08:15 PM	0.16		311.70	3996.1	6 leaf	98.1	98.3	98.5	98.0	97.8	264	4	438	Curtis
07/04	08:10 PM			313.24								210	into 5	445	Pivotrac
	04:25 AM			315.90								150	into 3	445	Pivotrac
-	03:00 AM		1.22	317.76	41	01.5		00 -	00 -	0.0 -	00.1	90	into N	445	Pivotrac
07/10	10:00 AM			324.40	4153.7	8 leaf	98.2	98.5	98.7	98.3	98.1	271	N	444	Curtis
07/10	10:30 AM			324.31								270	N	445	Pivotrac

Table 9: 2017 Field Data, "3 GPM" LEPA Corn, 260 bu/ac, Spain

		Rainfall	Irrigation	Water	Hour	Growth		Sc	il Moista	Ire		Pivot	1	Well	
Date	Time	(inches)	(inches)	Meter	Meter	Stage	1 Foot	2 Feet		4 Feet	5 Feet	Position	Crop Irrigate	(GPM)	Source
07/11	01:15 PM	(inches)	(menes)	326.51	meter	Stuge	11000	2100	5100	4100	5100	210	into 5	445	Pivotrac
07/12	09:40 PM			329.17								150	into 3	445	Pivotrac
07/13	09:00 PM			330.17	4224.7	9 leaf	78.0	97.9	99.2	98.7	98.5	118	3	449	Curtis
07/13	06:40 PM		1.13	330.90	7227.7	7 1041	70.0	71.7	<i>)).</i> 2	20.7	70.5	90	into N	445	Pivotrac
07/17	00:40 I M 04:10 AM		1.15	337.62								270	into 4	445	Pivotrac
07/17	11:40 AM			338.17	4322.7	11 leaf	49.5	89.0	99.4	99.0	98.8	253	4	434	Curtis
07/18	06:55 AM			339.82	4322.1	11 Ical	ч <i>у</i> .5	07.0	<i>))</i> . ,	77.0	70.0	210	into 5	445	Pivotrac
07/19	03:30 PM			342.51								150	into 3	445	Pivotrac
07/20	11:55 AM		1.01	344.19								90	into N	445	Pivotrac
07/21	11:15 AM		1.01	346.02	4417.7	12 leaf	92.4	86.9	98.3	98.2	98.2	30	N	4450	Curtis
07/23	06:45 PM			350.85	4417.7	12 1041	92.4	00.9	90.5	90.2	90.2	270	into 4	445	Pivotrac
07/24	11:45 AM			351.97	4490.1	12 leaf	92.4	86.9	98.3	98.2	98.2	231	4	455	Paul
07/24	09:05 PM			353.04	4490.1	12 1041	92.4	00.9	90.5	90.2	90.2	210		450	Pivotrac
07/24	05:25 AM			355.74								150	into 5	450	Pivotrac
			1.11										into 3		
07/27	01:50 AM 10:30 AM	0.27	1.11	357.44	45(1.0		04.6	0	06.4	00.1	08.2	90 71	into N	450	Pivotrac Paul
07/27		0.37		357.86	4561.0	pollinate	94.6	0	96.4	98.1	98.2		N	443	
07/30	09:30 AM	2.61		364.08	4621.0	11.4	10.0	07.0	00.0	00.0	00.7	273	stop	450	Pivotrac
08/02	02:50 PM	2.61		363.60	4631.9	blister	42.6	97.9	98.0	98.6	98.7	273	off		Curtis
08/07	9:50AM	2.45		363.60	4631.9	blister	4.3	97.3	97.0	97.6	97.7	273	off		Curtis
08/15	03:00 PM	3.45		363.76	4633.0	milk	48.3	98.2	98.0	98.3	98.3	271	Flush		Curtis
08/16	11:20 AM											278	move dry		Pivotrac
08/21	09:20 AM											278	start		Pivotrac
08/21	12:55 PM			364.36								270	into 4		Pivotrac
08/21	01:55 PM	0.24		364.14	4637.7	milk	86.5	98.0	98.2	98.2	98.1	268	4	443	Curtis
08/22	04:00 PM			366.59								210	into 5	445	Pivotrac
08/24	01:40 AM			369.36								150	into 3	445	Pivotrac
08/24	10:55 PM		1.20	371.20								90	into N	445	Pivotrac
08/28	06:15 AM			377.74								278	stop		Pivotrac
08/28	11:00 AM	0.24		377.13	4797.5	dough	86.3	98.1	98.3	98.1	98.2	278	off		Curtis
09/05	10:35 AM	0.11		377.13	4797.5	dent	56.4	97.6	97.9	97.8	97.9	278	off		Curtis
09/05	02:55 PM			377.13								278	start		Pivotrac
09/05	06:40 PM			378.01								270	into 4	440	Pivotrac
09/06	09:10 PM			380.17								210	into 5	440	Pivotrac
09/07	07:35 AM			382.98								150	into 3	440	Pivotrac
09/08	01:55 PM			382.94	4868.5	¼ mat line	36.3	97.4	98.3	98.5	98.7	131	3	445	Curtis
09/09	04:10 AM		1.10	384.65								90	into N	440	Pivotrac
09/11	10:15 AM			388.50	4936.6	⅓ mat line	59.2	95.8	97.4	97.9	98.2	330	N	450	Curtis
				391.28								270	N	440	Pivotrac
09/13	03:55 PM			393.43								210	4	440	Pivotrac
	02:00 AM			396.21								150	into 3	440	Pivotrac
09/15	12:55 PM	0.08		396.59	5035.3	⅓ mat line	42.3	91.5	97.2	98.0	98.4	119	3	451	Curtis
09/15	10:35 PM		1.10	397.89								90	into N	440	Pivotrac
09/18	2:00PM	0.34		402.24	5108.3	⅓ mat line	92.4	96.3	97.0	97.8	98.4	310	N	443	Curtis
09/19	07:10 AM			404.60								272	stop	450	Pivotrac
09/21	10:05 AM			403.94	5129.1	1/2 mat line	90.1	94.2	96.4	97.4	98.0	272	off		Curtis
09/25	11:20 AM	2.24		403.95	5129.1							272	off		Curtis
10/02	10:25 AM	1.08		403.95	5129.1							272	off		Curtis
10/10	03:15 PM	3.24		403.95	5129.1	black layer	97.7	97.9	97.3	98.2	98.3	272	off		Curtis
10/16	02:25 PM			403.95	5129.1	black layer	97.1	98.2	97.6	98.4	98.5	272	off		Curtis
10/23	02:10 PM			403.95	5129.1	black layer	97.0	97.8	97.3	98.1	98.2	272	off		Curtis
10/28						harvest									Stan
10/30	10:40 AM			403.95	5133.8	harvested	96.9	97.3	96.7	97.4	97.6	313	off		Curtis
Total		12.62	11.38				0.0	0.0	0.0	0.0	0.0	= 0.0"	Soil Moisture		Leon
Net soil	moisture is	0.00 inches	3.												
Rainfall	(12.62 in),	irrigation (1	1.38 in), a	nd net soi	l moisture	(0.00 in) is	total wa	ter (24.0	0 in).						
L	ers in red ar	0				,									

Table 9: 2017 Field Data, "3 GPM" LEPA Corn, 260 bu/ac, Spain (continued)

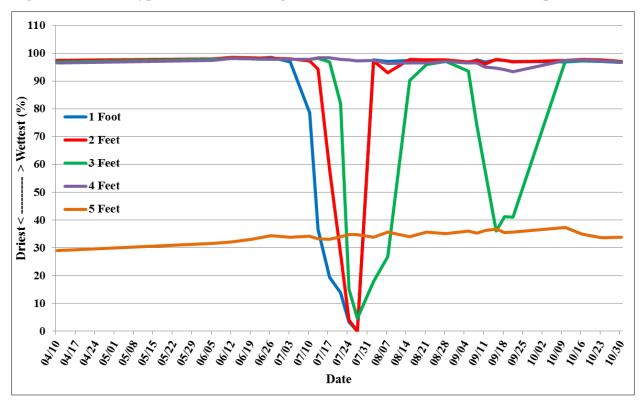
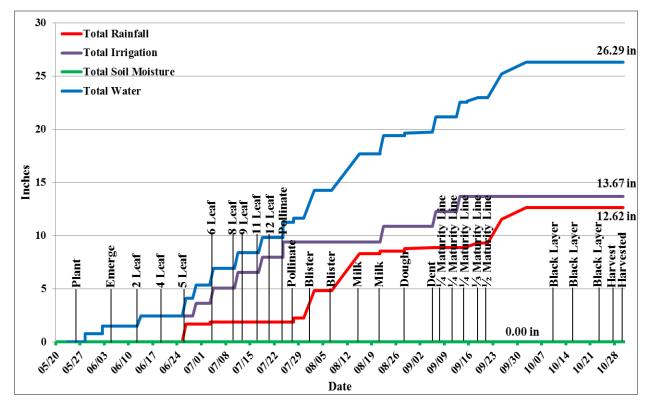


Figure 10: 2017 Gypsum Block Readings, "4 GPM" LEPA Corn, 270 bu/ac, Spain

Figure 11: 2017 Growing Season Water Tracking, "4 GPM" LEPA Corn, 270 bu/ac, Spain



	T .	Rainfall	Irrigation	Water	Hour	Growth						Pivot	a ti	Well	
Date	Time	(inches)	(inches)	Meter	Meter	Stage	1 Foot	2 Feet	3 Feet	4 Feet	5 Feet	Position	Crop Irrigate	(GPM)	Source
03/27	10:40AM	0.33		278.72								290			Curtis
04/03	10:25AM	2.02		278.72								290			Curtis
04/10	4:40PM			278.72	3592.8		97.6	97.5	97.0	96.5	29.1	290			C & L
04/24	11:30AM	0.75		278.72								290			Curtis
05/01	11:40AM	1.38		278.72								290			Curtis
05/15	9:40AM	0.48		278.72								270			Curtis
05/23	11:50AM	0.36		278.72								259			Curtis
05/25						plant									Stan
05/27	03:45 PM			278.72		-						278	start		Pivotrac
05/27	04:00 PM			278.74								270	into 4	445	Pivotrac
05/28	06:30 AM			279.93								210	into 5	445	Pivotrac
05/28	07:30 PM		0.78	281.00								150	into 3	445	Pivotrac
05/29	08:45 AM			282.10								90	into N	445	Pivotrac
05/30	11:05 AM			284.44	3668.3							329	N	448	Curtis
05/30	10:15 PM			285.19								278	stop	445	Pivotrac
05/31	08:35 AM			285.35	3679.6							278	off		Curtis
06/02	06:40 AM			285.35								278	start	445	Pivotrac
	08:30 AM			285.34								270	into 4	445	Pivotrac
06/02	09:20 PM		0.69	286.40								210	into 5	445	Pivotrac
-	10:30 AM			287.48								150	into 3	445	Pivotrac
06/03	11:25 PM			288.54								90	into N	445	Pivotrac
06/05	12:45 PM			291.94	3757.8	emerge	97.8	98.0	97.8	97.6	31.7	278	N	442	Curtis
06/05	01:15 PM			291.66								277	N	445	Pivotrac
06/12	09:20 AM			291.97	3758.0							277			Curtis
	11:30 AM			291.97								277	start		Pivotrac
06/12	01:25 PM			292.14	3759.7	2 leaf	98.5	98.7	98.3	98.2	32.2	271	N	452	Curtis
06/12	01:50 PM			291.86								270	into 4	445	Pivotrac
06/13	07:25 AM		0.95	293.30								210	into 5	445	Pivotrac
06/14	12:45 AM			294.73								150	into 3	445	Pivotrac
06/14	06:30 PM			296.19								90	into N	445	Pivotrac
06/16	09:00 PM			300.36								277	N	445	Pivotrac
	11:00 AM			300.67	3863.3	4 leaf	98.1	98.4	98.0	98.0	33.1	277			Curtis
	02:30 PM			300.69								277	start	445	Pivotrac
	04:50 PM			300.55								270	into 4	-	Pivotrac
06/25	11:30 PM											250	4		Pivotrac
-				301.41	3872.9	5 leaf	98.7	98.2	97.9	97.9	34.4	250	off		Curtis
	05:00 PM											250	start		Pivotrac
	08:35 AM		1.21	302.40			1					210	into 5	445	Pivotrac
-	05:20 AM			304.11								150	into 3	445	Pivotrac
	02:40 AM			305.86			1					90	into N	445	Pivotrac
	05:25 PM			311.03			1					270	into 4	445	Pivotrac
07/03	08:15 PM			311.70	3996.1	6 leaf	97.0	98.1	97.8	97.8	33.8	264	4	438	Curtis
07/04	08:10 PM	5.10	1.44	313.24		- 1041						210	into 5	445	Pivotrac
				315.90								150	into 3	445	Pivotrac
	03:00 AM			317.76								90	into N	445	Pivotrac
	10:00 AM			324.40	4153.7	8 leaf	78.7	97.4	97.8	97.9	34.2	271	N	444	Curtis
-	10:30 AM			324.31	1100.1	0 1041	, 5.7	77.1	77.0	71.7	51.2	270	N	445	Pivotrac
07/10	10.30 /101			J 4 7.JI			1	I	I		I	210	11	J	1 IVOLIAU

Table 10: 2017 Field Data, "4 GPM" LEPA Corn, 270 bu/ac, Spain

		Rainfall	Irrigation	Water	Hour	Growth		So	il Moist	11170		Pivot		Well	
Date	Time	(inches)	(inches)	Meter	Meter	Stage	1 Foot	2 Feet			5 Feet	Position	Crop Irrigate	(GPM)	Source
07/11	01:15 PM	(menes)	1.44	326.51	wieter	Suge	11000	2100	51000	+1000	5100	210	into 5	445	Pivotrac
07/12	09:40 PM		1.77	329.17								150	into 3	445	Pivotrac
07/12	09:00 PM			330.17	4224.7	9 leaf	36.6	94.4	98.2	98.4	33.3	118	3	449	Curtis
07/13	06:40 PM			330.90	7227.7) icai	50.0	74.4	70.2	70.4	55.5	90	into N	445	Pivotrac
	00:40 I M			337.62								270	into A	445	Pivotrac
07/17	11:40 AM			338.17	4322.7	11 leaf	19.5	58.3	96.9	98.5	33.2	253	4	434	Curtis
07/17	06:55 AM		1.44	339.82	4322.7		19.5	50.5	90.9	90.5	33.2	233	into 5	434	Pivotrac
			1.44									150			Pivotrac
07/19 07/20	03:30 PM 11:55 AM			342.51 344.19								90	into 3 into N	445 445	Pivotrac
	11:15 AM			346.02	4417.7	12 leaf	13.8	27.9	81.9	97.9	34.1	32	N	443	Curtis
07/21	06:45 PM			350.85	4417.7	12 1041	15.0	21.9	01.9	91.9	34.1	270	into 4	445	Pivotrac
07/24	11:45 AM			351.97	4490.1	pollinate	3.3	4.1	15.2	97.7	34.7	231	4	455	Paul
07/24	09:05 PM		1.44	353.04	4490.1	pomnate	5.5	4.1	15.2	91.1	34.7	231	4 into 5	450	Pivotrac
07/24	09:03 PM 05:25 AM		1.44	355.74								150		450	Pivotrac
	03:23 AM 01:50 AM			357.44								90	into 3	450	Pivotrac
	10:30 AM	0.37		357.86	4561.0	nollinoto	0	0	4.6	97.4	34.7	90 71	into N	430	1
		0.37			4301.0	pollinate	0	0	4.0	97.4	34.7		N		Paul
07/30	09:30 AM	2.61		364.08	4631.9	1-1:	07.7	07.2	17.0	07.6	22.0	273	stop	450	Pivotrac
08/02	02:50 PM	2.61		363.60		blister	97.7	97.3	17.9	97.6	33.9	273	off		Curtis
08/07	9:50AM	2.45		363.60	4631.9	blister	97.1	93.1	26.8	96.4	35.8	273	off		Curtis
08/15	03:00 PM	3.45		363.76	4633.0	milk	97.5	97.9	90.3	96.5	34.1	271	Flush		Curtis
	11:20 AM											278	move dry	440	Pivotrac
08/21	09:20 AM			264.26								278	start	440	Pivotrac
08/21	12:55 PM	0.24		364.36	1027.7	-11	07.5	07.7	0.6.1	06.6	25.7	270	into 4	440	Pivotrac
08/21	01:55 PM	0.24	1.40	364.14	4637.7	milk	97.5	97.7	96.1	96.6	35.7	268	4	443	Curtis
08/22	04:00 PM		1.46	366.59								210	into 5	445	Pivotrac
	01:40 AM			369.36								150	into 3	445	Pivotrac
08/24	10:55 PM			371.20								90	into N	445	Pivotrac
08/28	06:15 AM	0.04		377.74	1505.5		07.4	05.5	07.0	07.1	25.1	278	stop		Pivotrac
08/28	11:00 AM	0.24		377.13	4797.5	dough	97.4	97.7	97.2	97.1	35.1	278	off		Curtis
	10:35 AM	0.11		377.13	4797.5	dent	96.6	97.0	93.6	96.5	36.0	278	Off		Curtis
09/05	02:55 PM			377.13								278	start	110	Pivotrac
09/05	06:40 PM			378.01								270	into 4	440	Pivotrac
09/06	09:10 PM		1.41	380.17								210	into 5	440	Pivotrac
09/07	07:35 AM			382.98	10.00 5	1/ 1/	07.7	07.6	74.0	06.6	25.2	150	into 3	440	Pivotrac
09/08	01:55 PM			382.94	4868.5	¼ mat line	97.7	97.6	74.2	96.6	35.3	131	3	445	Curtis
	04:10 AM			384.65	1026.6	1/ 1	060	06.0	<i></i>	05.0	26.2	90	into N	440	Pivotrac
09/11	10:15 AM			388.50	4936.6	⅓ mat line	96.9	96.3	57.7	95.2	36.2	330	N	450	Curtis
09/12	01:30 PM		1 41	391.28								270	<u>N</u> 4	440	Pivotrac
	03:55 PM		1.41	393.43								210		440	Pivotrac
	02:00 AM	0.00		396.21	5025.2	1/ 1	07.7	07.0	26.0	04.7	26.0	150	into 3	451	Pivotrac
	12:55 PM	0.08		396.59	5035.3	⅓ mat line	97.7	97.9	36.0	94.7	36.9	119	3	440	Curtis
	10:35 PM	0.24		397.89	5104.5	1/ 1	07.5	07.6	41.0	04.0	25.5	90	into N	445	Pivotrac
	10:10 AM	0.34		402.24	5104.5	⅓ mat line	97.5	97.6	41.2	94.2	35.5	319	N	450	Curtis
	07:10 AM			404.60	5100 I		05.4	0.6.0		00.1		272	stop		Pivotrac
09/21	10:05 AM	2.21		403.95	5129.1	1/2 mat line	97.1	96.9	41.1	93.4	35.7	272	off		Curtis
	11:20 AM	2.24		403.95	5129.1							272	off		Curtis
	10:25AM	1.08		403.95	5129.1	11 1 1	07.0	07.5	07.1	07.5	27.2	272	off		Curtis
	03:15 PM	2.21		403.95		black layer	97.0	97.6	97.4	97.6	37.3	272	off		Curtis
	02:25 PM	3.24		403.95	5129.1	black layer		97.8	97.6	97.7	35.0	272	off		Curtis
	02:10 PM			403.95	5129.1	black layer	97.2	97.7	97.4	97.4	33.7	272	off		Curtis
10/28	10.10.15			102		harvest	0	0	0.5.5	0	aa -				Stan
	10:40 AM	10.10	10	403.95	5133.8	harvested	96.7	97.1	96.9	96.8	33.8	313	move dry		Curtis
Total	l	12.62	13.67				0.0	0.0	0.0	0.0	0.0	= 0.0"	Soil Moisture		Leon
	moisture is					(0.00.1.)				<u>,</u>					
		0	. ,.			re (0.00 in) i	is total	water (2	26.29 ii	1).					
*Numbe	ers in red a	e not cou	nted in the	total rainf	all.										

Table 10: 2017 Field Data, "4 GPM" LEPA Corn, 270 bu/ac, Spain (continued)

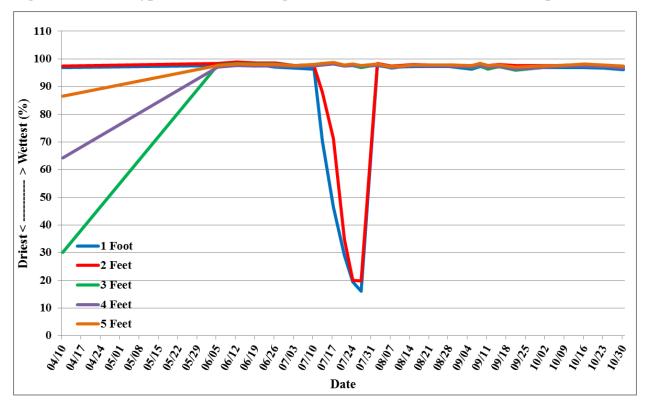
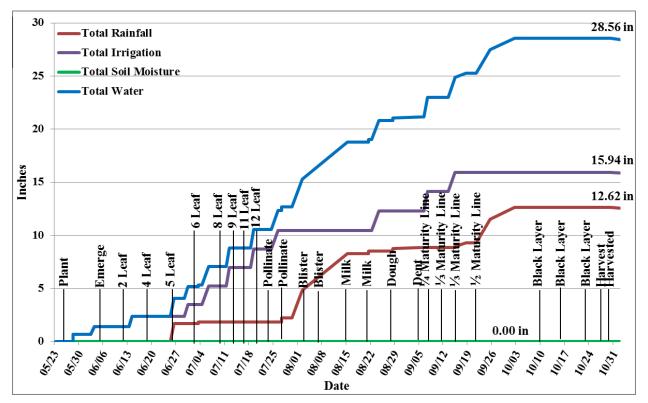


Figure 12: 2017 Gypsum Block Readings, "5 GPM" LEPA Corn, 270 bu/ac, Spain

Figure 13: 2017 Growing Season Water Tracking, "5 GPM" LEPA Corn, 270 bu/ac, Spain



_		Rainfall	Irrigation	Water	Hour	Growth	th Soil Moisture					Pivot		Well	
Date	Time	(inches)	(inches)	Meter	Meter	Stage	1 Foot	2 Feet	-		5 Feet	Position	Crop Irrigate	(GPM)	Source
03/27	10:40 AM	0.33		278.72								290			Curtis
04/03	10:25 AM	2.02		278.72								290			Curtis
-	04:40 PM			278.72	3592.8		96.8	97.5	30.1	64.3	86.6	290			C & L
04/24	11:30 AM	0.75		278.72								290			Curtis
	11:40 AM	1.38		278.72								290			Curtis
	09:40 AM	0.48		278.72								270			Curtis
05/23	11:50AM	0.36		278.72								259			Curtis
05/25						plant									Stan
05/27	03:45 PM			278.72		^						278	start		Pivotrac
05/27	04:00 PM			278.74								270	into 4	445	Pivotrac
05/28	06:30 AM			279.93								210	into 5	445	Pivotrac
05/28	07:30 PM		0.70	281.00								150	into 3	445	Pivotrac
05/29	08:45 AM			282.10								90	into N	445	Pivotrac
05/30	11:05 AM			284.44	3668.3							329	N	448	Curtis
05/30	10:15 PM			285.19			1					278	stop	445	Pivotrac
05/31	08:35 AM			285.35	3679.6							278	off		Curtis
06/02	06:40 AM			285.35								278	start	445	Pivotrac
06/02	08:30 AM			285.34								270	into 4	445	Pivotrac
-	09:20 PM			286.40								210	into 5	445	Pivotrac
06/03	10:30 AM		0.71	287.48								150	into 3	445	Pivotrac
06/03	11:25 PM			288.54								90	into N	442	Pivotrac
06/05	12:45 PM			291.94	3757.8	emerge	97.7	98.3	97.9	97.1	97.6	278	N	445	Curtis
06/05	01:15 PM			291.66								277	N		Pivotrac
06/12	09:20 AM			291.97	3758.0							277			Curtis
	11:30 AM			291.97								277	start	452	Pivotrac
06/12	01:25 PM			292.14		2 leaf	98.3	98.9	98.4	97.7	98.2	271	N	445	Curtis
06/12	01:50 PM			291.86								270	into 4	445	Pivotrac
06/13	07:25 AM			293.30								210	into 5	445	Pivotrac
06/14	12:45 AM		0.94	294.73								150	into 3	445	Pivotrac
06/14	06:30 PM			296.19			1					90	into N	445	Pivotrac
06/16	09:00 PM			300.36								277	N		Pivotrac
06/19	11:00 AM			300.67	3863.3	4 leaf	98.0	98.6	98.1	97.5	98.0	277			Curtis
06/25	02:30 PM			300.69								277	start	445	Pivotrac
06/25	04:50 PM			300.55								270	into 4		Pivotrac
06/25	11:30 PM											250	4		Pivotrac
06/26	02:15 PM	1.70		301.41	3872.9	5 leaf	97.0	998.5	98.1	97.5	98.0	250			Curtis
06/28	05:00 PM											250	start	445	Pivotrac
06/29	08:35 AM			302.40								210	into 5	445	Pivotrac
	05:20 AM		1.12	304.11								150	into 3	445	Pivotrac
	02:40 AM			305.86								90	into N	445	Pivotrac
				311.03			1					270	into 4	438	Pivotrac
07/03	08:15 PM	0.16		311.70	3996.1	6 leaf	96.6	97.6	97.7	97.2	97.7	264	4	445	Curtis
	08:10 PM			313.24								210	into 5	445	Pivotrac
07/06	04:25 AM		1.74	315.90								150	into 3	445	Pivotrac
07/07	03:00 AM			317.76								90	into N	444	Pivotrac
07/10	10:00 AM			324.40	4153.7	8 leaf	96.4	97.5	98.0	97.5	98.0	271	N	445	Curtis
07/10	10:30 AM			324.31								270	N	445	Pivotrac

Table 11: 2017 Field Data, "5 GPM" LEPA Corn, 270 bu/ac, Spain

		Rainfall	Irrigation	Water	Hour	Growth		So	il Moist	ure		Pivot		Well	
Date	Time	(inches)	(inches)	Meter	Meter	Stage	1 Foot	2 Feet			5 Feet	Position	Crop Irrigate	(GPM)	Source
07/11	01:15 PM	(menes)	(incines)	326.51	1110101	Suge	11000	21000	51000	11000	5 1 000	210	into 5	445	Pivotrac
07/12	09:40 PM		1.74	329.17								150	into 3	449	Pivotrac
07/13	09:00 PM		1.71	330.17	4224.7	9 leaf	70.3	87.8	98.4	97.9	98.4	118	3	445	Curtis
07/13	06:40 PM			330.90	7227.7) icui	70.5	07.0	70.4)1.)	70.4	90	into N	445	Pivotrac
07/17	04:10 AM			337.62								270	into 4	434	Pivotrac
07/17	11:40 AM			338.17	4322.7	11 leaf	46.4	71.2	98.6	98.2	98.7	253	4	445	Curtis
07/18	06:55 AM			339.82	4322.1	11 Kai	40.4	/1.2	70.0	70.2	70.7	210	into 5	445	Pivotrac
07/19	03:30 PM		1.76	342.51								150	into 3	445	Pivotrac
	11:55 AM		1.70	344.19								90	into S	441	Pivotrac
07/21	11:15 AM			346.02	4417.7	12 leaf	29.0	34.8	97.7	97.5	97.9	32	N	445	Curtis
07/23	06:45 PM			350.85	4417.7	12 Kai	27.0	54.0	71.1	71.5	71.7	270	into 4	455	Pivotrac
07/24	11:45 AM			351.97	4490.1	pollinate	19.5	20.1	97.6	97.6	98.2	231	4	450	Paul
07/24	09:05 PM			353.04	4490.1	pomnate	19.5	20.1	97.0	97.0	90.2	231	4 into 5	450	Pivotrac
	09:03 PM 05:25 AM		1.76	355.74								150	into 3	450	Pivotrac
07/27	03.23 AM 01:50 AM		1.70	357.44								90		442	Pivotrac
07/27	10:30 AM	0.37			4561.0	nollinoto	16.1	10.9	06.9	07.4	97.7	90 71	into N	442	Paul
07/30	09:30 AM	0.57		357.86	4561.0	pollinate	16.1	19.8	96.8	97.4	91.1	273	N	430	Pivotrac
		2.61		364.08	4621.0	1.1	07.0	00.2	08.0	07.7	00.2		stop		<u> </u>
08/02	02:50 PM 9:50AM	2.61		363.60	4631.9	blister	97.9	98.3	98.0	97.7	98.2	273	off		Curtis
08/07		2.45		363.60	4631.9	blister	97.0	97.5	96.7	96.8	97.2	273	off		Curtis
08/15	03:00 PM	3.45		363.76	4633.0	milk	97.3	98.0	97.8	97.6	97.9	271	Flush		Curtis
	11:20 AM											278	move dry		Pivotrac
	09:20 AM											278	start		Pivotrac
08/21	12:55 PM			364.36								270	into 4	445	Pivotrac
08/21	01:55 PM	0.24		364.14	4637.7	milk	97.2	97.9	97.6	97.4	97.8	268	4	443	Curtis
08/22	04:00 PM			366.59								210	into 5	445	Pivotrac
08/24	01:40 AM		1.81	369.36								150	into 3	445	Pivotrac
08/24	10:55 PM			371.20								90	into N	445	Pivotrac
08/28	06:15 AM			377.74								278	stop		Pivotrac
	11:00 AM	0.24		377.13	4797.5	dough	97.2	97.9	97.6	97.4	97.9	278	off		Curtis
	10:35 AM	0.11		377.13	4797.5	dent	96.4	97.4	96.8	97.0	97.6	278	Off		Curtis
09/05	02:55 PM			377.13								278	start		Pivotrac
09/05	06:40 PM			378.01								270	into 4	440	Pivotrac
09/06	09:10 PM			380.17								210	into 5	440	Pivotrac
09/07	07:35 AM		1.84	382.98								150	into 3	445	Pivotrac
09/08	01:55 PM			382.94	4868.5	¼ mat line	97.2	98.3	97.5	97.6	98.3	131	3	445	Curtis
09/09	04:10 AM			384.65								90	into N	445	Pivotrac
09/11	10:15 AM			388.50	4936.6	⅓ mat line	96.8	97.7	96.4	96.8	97.6	330	off	450	Curtis
	01:30 PM			391.28								270	N	440	Pivotrac
09/13	03:55 PM			393.43								210	4	440	Pivotrac
09/15	02:00 AM		1.82	396.21								150	into 3	440	Pivotrac
09/15	12:55 PM	0.08		396.59	5035.3	⅓ mat line	97.3	98.0	97.3	97.3	97.8	119	3	451	Curtis
09/15	10:35 PM			397.89								90	into N	440	Pivotrac
09/18	10:10 AM	0.34		402.24	5104.5							319	N	445	Curtis
09/19	07:10 AM			404.60								272	stop	450	Pivotrac
	10:05 AM			403.95	5129.1	1/2 mat line	96.9	97.6	95.9	96.4	97.1	272	off		Curtis
	11:20 AM	2.24		403.95	5129.1							272	off		Curtis
	10:25 AM	1.08		403.95	5129.1							272	off		Curtis
	03:15 PM	3.24		403.95		black layer	96.8	97.7	97.8	97.4	97.9	272		off	Curtis
	02:25 PM			403.95		black layer		97.8	97.7	97.4	98.1	272		off	Curtis
	02:10 PM			403.95	5129.1	black layer		97.5	97.4	97.2	97.8	272		off	Curtis
10/23	52.10 I WI			105.75	5127.1	harvest	20.7	71.5	71.7	71.2	21.0	313	move dry	011	Stan
	10:45 AM			403.95	5133.8	harvested	96.2	97.1	96.8	96.7	97.4	313	move ury	off	Curtis
Total	10.45 AWI	12.62	15.94	-03.75	Soil	nai vesteu	0.0	0.0	0.0	0.0	0.0	= 0.0"	Soil Moisture	011	Leon
	moisture is				501	I	0.0	0.0	0.0	0.0	0.0	- 0.0	Son moisture		LCOII
				and not -	oil moist-	ra (0.00)	is total	watar //	18 56 :	.)					
	· /·	<u> </u>	· · · · · ·			re (0.00 in) i	is iotal	water (20.30 1	1).					
TNumbe	ers in red ar	e not cour	nted in the	total rainf	all.										

Table 11: 2017 Field Data, "5 GPM" LEPA Corn, 270 bu/ac, Spain (continued)

2017 Harvest Results, LEPA Corn, Spain

The 3 GPM field produced a 260 bushel per acre corn yield. Irrigation totaled 11.38 inches. Production in the 4 GPM field was 270 bushels per acre; seasonal irrigation totaled 13.67 inches. Corn yield was 270 bushels per acre for the 5 GPM field; irrigation totaled 15.94 inches. There was no pre-season irrigation.

The 4 GPM field produced 10 more bushels per acre than the 3 GPM field. Irrigation was 2.29 inches more. The 5 GPM field produced 10 more bushels per acre than the 3 GPM with 4.56 more inches of irrigation. The 5 GPM yield was the same 270 bushels per acre as that from 4 GPM field with 2.27 additional inches of irrigation.

Corn production was 22.85 bushels (1279 lb.) per inch of irrigation in the 3 GPM field compared to 19.75 bushels (1106 lb.) in the 4 GPM and 16.94 bushels (948 lb.) from the 5 GPM field. Production from each inch of irrigation, rainfall, and net soil water that totaled 24.00 inches was 10.83 bushels (606 lb.) per acre in the 3 GPM field. Irrigation, rainfall, and net soil water totaled 26.29 inches in the 4 GPM field where production was 10.27 bushels (575 lb.) per inch. In the 5 GPM field, irrigation, rainfall, and net soil water totaled 28.56 inches where production was 9.45 bushels (529 lb.) per inch of total water.

Crop production costs were \$23.85 per acre more for the 4 GPM field than for the 3 GPM from increased irrigation, fertilizer, and harvest expenses. At \$3.63 per bushel, the 10 bushels per acre increased corn yield in the 4 GPM field amounted to \$36.30 more per acre than from the 3 GPM field. The 4 GPM field's net gain is \$12.45 per acre with 2.29 inches more irrigation used compared to production from the 3 GPM field. At \$3.63 per bushel, the 10 bushel per acre increased yield from the 5 GPM field compared to the 3 GPM amounts to \$36.30 per acre. Crop production costs were \$37.93 per acre more for the 5 GPM field. The 5 GPM field's net loss compared to the 3 GPM field is \$1.63 per acre with 4.56 additional inches of irrigation. Corn yields were 270 bushels per acre in both the 4 GPM and 5 GPM fields. Production costs were \$14.08 more for the 5 GPM field than the 4 GPM field. Net gain for the 4 GPM field was \$14.08 per acre with 2.27 inches less irrigation.

Net return from the 3 GPM field was \$515.76 per acre compared to \$528.22 from the 4 GPM field and \$514.14 from the 5 GPM field. Net return from each inch of irrigation is \$45.32 for the 3 GPM field compared to \$38.64 from the 4 GPM and \$32.25 for the 5 GPM field. A summary of the demonstration results are shown in Table 12 and Appendix B.

	Irrigation	Total -	Prod	luction	Gross	Crop Value @	\$3.63/bu
GPM	(in)	Water (in)	bu/ac	lb/ac-in of	nor coro (¢)	Acre-inch of	Acre-in of
	(11)	water (III)	0u/ac	Irrigation	per acre (\$)	Irrigation (\$)	Total Water
3 GPM	11.38	24.00	260	1279	\$943.80	\$82.93	\$39.32
4 GPM	13.67	26.29	270	1106	\$980.10	\$71.70	\$37.28
5 GPM	15.94	28.56	270	948	\$980.10	\$61.48	\$34.32
All fields inc	lude 0.00 i	nches of so	il water wi	ithin 5 feet o	f soil, only ra	ainfall and irrigation	tion.

Table 12: 2017 LEPA Demonstration Results, Spain

Harold Grall's 2017 LEPA Shroud and T-L PMDI Corn Demonstration

2017 Planting and Crop Information LEPA and PMDI Corn, Grall

Harold Grall strip tilled and planted 120 acres of corn in the NW ¼ of Section 328 circle for his "3, 4, 5 GPM" and "LEPA Shroud and T-L PMDI Irrigation System" demonstration. Senninger LEPA Shroud applicators were installed 30 inches apart in spans 2, 3, 4, 5, 7, 8, and the end section prior to the 2015 growing season and continues to use his improved center pivot irrigation water application system to support the low available groundwater and well irrigation capacity for the 120 acres of corn. T-L PMDI drag lines were installed 30 inches apart in span 6. LDN LESA spray applicators remain in span 1. Grall planted the LEPA Shroud and PMDI fields with Pioneer 1151AMX hybrid. Seeding rate for the "3, 4, 5 GPM "LEPA Shroud and PMDI fields was 28,000 seeds per acre. Center pivot travel was tracked by Pivotrac. Seasonal water meter readings averaged 283 gallons per minute. Irrigation capacity averaged 0.88 inches in a 7 day circle revolution. Both the LEPA Shroud and T-L PMDI fields received hail damage on June 25 at the 6 to 7 leaf growth stage. Harvest yields in this report were adjusted to 30% damage according to the crop insurance adjustment for the fields. Planting and crop information for "Grall LEPA Shroud" and "Grall T-L PMDI" are shown in Table 13 below.

3 GPM LEPA S	Shroud Demonstration Site: Sp		End Section, 270-210 degrees
Planted	May 25	Harvested	November 7
Hybrid	Pioneer P1151AMX	Seeding Rate	28,000
Row Width	30 inches	Tillage	Strip Till
No. Acres	79.80	GPM/Acre	2.36
Total Water	24.16 inches	Soil Type	Sherm Silty Clay Loam
Irrigation	13.08 inches	Insecticide	Comite, Stratego Fungicide
3 GPM T-L PM	IDI Demonstration Site: Span	6, 270-210 degrees	
Planted	May 25	Harvested	November 7
Hybrid	Pioneer P1151AMX	Seeding Rate	28,000
Row Width	30 inches	Tillage	Strip Till
No. Acres	16.90	GPM/Acre	2.36
Total Water	24.16 inches	Soil Type	Sherm Silty Clay Loam
Irrigation	13.08 inches	Insecticide	Comite, Stratego Fungicide
4 GPM LEPA S	Shroud Demonstration Site: Sp	oans 2, 3, 4, 5, 7, 8 and 1	End Section, 210-240 degrees
Planted	May 25	Harvested	November 7
Hybrid	Pioneer P1151AMX	Seeding Rate	28,000
Row Width	30 inches	Tillage	Strip Till
No. Acres	8.00	GPM/Acre	3.14
Total Water	28.92 inches	Soil Type	Sherm Silty Clay Loam
Irrigation	17.84 inches	Insecticide	Comite, Stratego Fungicide
4 GPM T-L PM	IDI Demonstration Site: Span	6, 210-240 degrees	
Planted	May 25	Harvested	November 7
Hybrid	Pioneer P1151AMX	Seeding Rate	28,000
Row Width	30 inches	Tillage	Strip Till
No. Acres	1.70	GPM/Acre	3.14
Total Water	28.92 inches	Soil Type	Sherm Silty Clay Loam
Irrigation	17.84 inches	Insecticide	Comite, Stratego Fungicide

Table 13: 2017 Planting and Crop Information, LEPA Shroud & T-L PMDI, Harold Grall

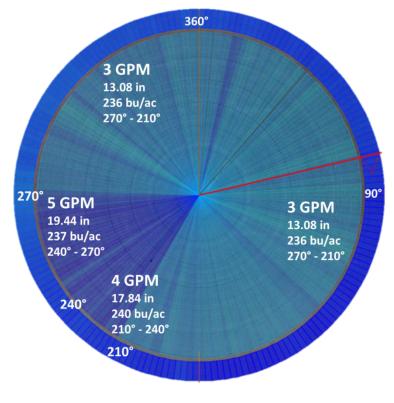
5 GPM LEPA S	Shroud Demonstration Site: Sp	oans 2, 3, 4, 5, 7, 8 and 1	End Section, 240-270 degrees
Planted	May 25	Harvested	November 7
Hybrid	Pioneer P1151AMX	Seeding Rate	28,000
Row Width	30 inches	Tillage	Strip Till
No. Acres	8.00	GPM/Acre	3.93
Total Water	30.52 inches	Soil Type	Sherm Silty Clay Loam
Irrigation	19.44 inches	Insecticide	Comite, Stratego Fungicide
5 GPM T-L PM	IDI Demonstration Site: Span	6, 240-270 degrees	
Planted	May 25	Harvested	November 7
Hybrid	Pioneer P1151AMX	Seeding Rate	28,000
Row Width	30 inches	Tillage	Strip Till
No. Acres	1.70	GPM/Acre	3.93
Total Water	30.52 inches	Soil Type	Sherm Silty Clay Loam
Irrigation	19.44 inches	Insecticide	Comite, Stratego Fungicide

Table 13: 2017 Planting and Crop Information, LEPA Shroud & T-L PMDI, Grall(continued)

2017 Water Intensity Map, "3-4-5 GPM" LEPA Shroud Corn, Grall

Seasonal irrigation was 17.84 inches per acre for the 4 GPM LEPA field from 210 to 240 degrees compared to 13.08 inches for the 3 GPM field from 270 to 210 degrees. Center pivot travel speed was reduced each revolution to apply 19.44 inches of irrigation from 240 to 270 degrees in the circle for the 5 GPM LEPA field. A Water Intensity Map (courtesy of Pivotrac) was developed for the "3-4- 5 GPM" project.

Figure 14: 2017 Water Intensity Map, "3-4-5 GPM" LEPA Shroud Corn, Grall



2017 Water Intensity Map, "3-4-5-GPM" T-L PMDI Corn, Grall

Seasonal irrigation totaled 13.08 inches for the 3 GPM T-L PMDI field compared to 17.84 inches for the 4 GPM. The 3 GPM field was from 270 to 210 degrees and the 4 GPM 210 to 240 degrees in the circle. 19.44 inches of irrigation was applied for the 5 GPM field from 240 to 270 degrees in the circle. T-L PMDI was in span 6 of the 8 span center pivot. A Water Intensity Map (courtesy of Pivotrac) was developed for the "3-4-5 GPM" project.

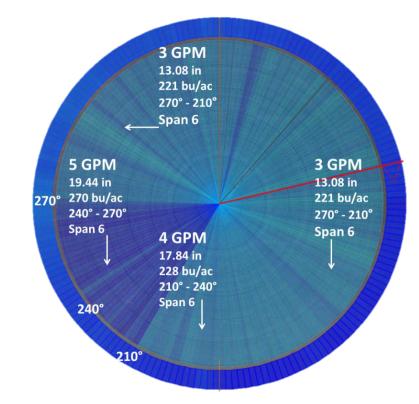


Figure 15: 2017 Water Intensity Map, "3-4-5 GPM" T-L PMDI Corn, Grall

2017 Soil Water Profile and Growing Season Rainfall Corn, Grall

"LEPA Shroud" Demonstration Site

Preseason soil water was good at 1, 2, 3, 4, and 5 feet in the 3 GPM, 4 GPM, and 5 GPM LEPA fields. Periodic timely, beneficial rainfall helped produce the crop. Soil type for each field was Sherm silty clay loam that can store approximately 2.00 inches of available water per foot for potential crop use. Soil moisture sensors showed the crop in each "GPM" field had adequate soil water during the growing season. Rainfall totaled 11.08 inches from planting until grain maturity in late October.

"3 GPM": Plants used more water than rainfall and irrigation provided beginning in early-July at 8 leaves when rainfall totaled 0.80 inches for the month. Soil moisture sensors show no soil water was used from beyond 1 foot in the plant root zone during the growing season. Net soil water used to produce the crop was 0.00 inches. Late season rainfall refilled the plant root zone to the level at planting.

"4 GPM": Plant roots used soil water from 1 and 2 feet at the tassel growth stage in July in addition to rainfall and irrigation. Only limited water was used from 3, 4, and 5 feet during the growing season. No net soil water was used to produce the crop. Late season rainfall refilled the 1 and 2 feet plant root zone similar to the level at planting.

"5 GPM": Plants used water primarily from 1 and 2 feet in July at the tassel growth stage when rainfall and irrigation was not enough. Soil moisture sensors showed water use from 1 foot beginning in early-July and from 2 feet in mid-July. There was no significant use from 3, 4, and 5 feet during the growing season. Abundant rainfall in August followed by more in October refilled the plant root zone at 1 and 2 feet similar to the level at planting, resulting in no net soil water use.

"T-L PMDI" Demonstration Site

Soil water was good at 1, 2, 3, 4, and 5 feet prior to planting in each 3, 4, and 5 GPM T-L PMDI field. Soil moisture sensors show the crop had sufficient soil water during the growing season. Total rainfall from planting through black layer totaled 11.08 inches. The crop was produced in Sherm silty clay loam soil that holds approximately 2.00 inches available water per foot for potential crop use.

"3 GPM": Weekly gypsum block readings showed plants used about 30% of the water from 1 foot in the soil profile and 20% stored at 2 feet in addition to irrigation and rainfall at tassel during mid to late July. The sensors show only limited to no water use from 3, 4, and 5 feet producing the crop. Net soil water totaled 0.00 inches, following abundant rainfall in August followed by irrigation and rainfall in September.

"4 GPM": Plants used about 30% of the soil water from 1 foot and 20% from 2 feet in the soil profile by mid to late-July in addition to irrigation and rainfall. Soil water sensors showed no water use from 3, 4, and 5 feet producing the crop, indicating sufficient water was available. Net soil water use was 0.00 inches.

"5 GPM": Soil water sensors showed the 1 foot soil profile was only 20% of capacity prior to planting, but preseason rainfall refilled it by planting time. Roots began to use water from 1 foot in the soil profile in mid to late-July at tassel growth stage, in addition to rainfall and irrigation. Plant roots used additional water from the 1 foot zone in September. Soil moisture sensors showed no water was used from 2, 3, 4, and 5 feet of the soil profile. Late season irrigation and rainfall refilled the 1, 2, 3, 4, and 5 feet root zones, resulting in no net soil water use producing the crop.

Table 14: 2017 Monthly Rainfall Data, LEPA Shroud and T-L PMDI Corn, Grall

System	June (in)	July (in)	August (in)	September (in)	Total (in)
LEPA, PMDI	1.41	0.80	7.94	0.93	11.08

2017 Growing Season Water Tracking, LEPA Shroud and T-L PMDI Corn, Grall

The district tracked total water and crop growth throughout the growing season using rain gauges, water meters, and both gypsum blocks and AquaSpy® soil moisture sensors. One set of five gypsum block soil moisture sensors was installed at 1, 2, 3, 4, and 5 feet. An AquaSpy[™] soil moisture probe was installed down to 4 feet in the root zone at one location to monitor soil water levels in the "3 GPM" LEPA and "3 GPM" PMDI fields. Another set of the same type of sensors

were installed in the "4 GPM" and "5 GPM" fields. Both the gypsum block sensors and the soil probe were installed in close proximity to each other in each field. Gypsum blocks, water meter, rain gauges, and crop growth were read, recorded, and utilized weekly by district personnel. A 24/7 Aquaspy probe website showed soil moisture at 4 inch increments to 48 inches and monitored plant root growth. The website listed all Aquaspy soil probes in the "3-4-5 GPM" project and was available to all cooperators and district personnel. Another 24/7 Pivotrac website tracked each center pivot, monitored system position and travel, and provided information to make irrigation strategic management decisions. Both the cooperating grower and district "3-4-5 GPM" Project Leader collectively monitored, controlled, and managed irrigation from the Pivotrac website.

Following this paragraph, a series of graphs and tables shows weekly gypsum block readings for the season; growing seasonal water, including rainfall, irrigation, and soil moisture at various growth stages; and the order of irrigation and rainfall events for each "3-4-5 GPM" field. Finally, a form describes the protocols for each field. "Total Water," as shown on the graph for growing season water, is the sum of seasonal irrigation, rainfall, and net soil water. Graphs and tables for the 3 GPM acres are shown first, followed by the same illustrations for each 4 GPM and 5 GPM LEPA and PMDI fields.

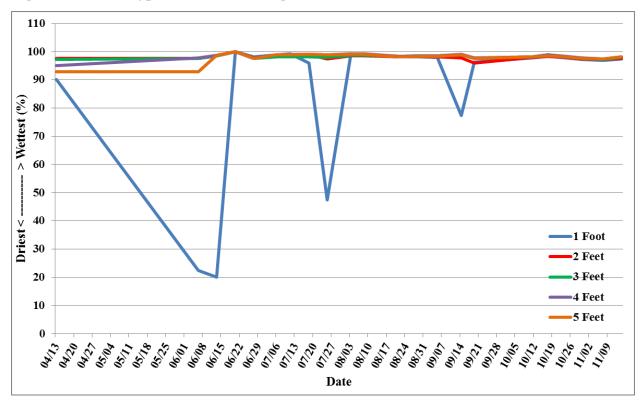
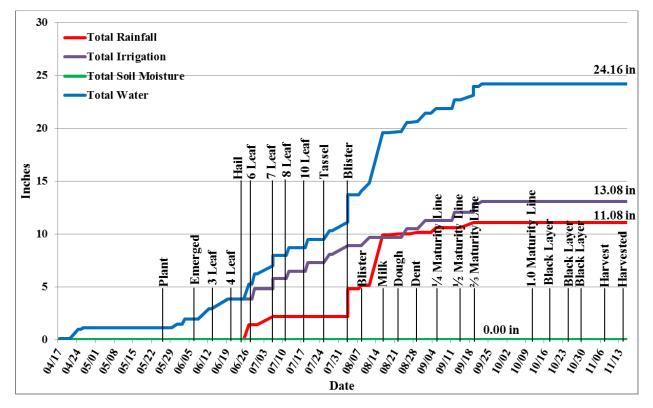


Figure 16: 2017 Gypsum Block Readings, "3 GPM" LEPA Shroud Corn, 236 bu/ac, Grall

Figure 17: 2017 Growing Season Water Tracking, "3 GPM" LEPA Shroud Corn, 236 bu/ac, Grall



		r		,						· · ·	-50 k	,	Uran		î
Date	Time		Irrigation	Water	Hour	Growth			l Moist			Pivot	Crop Irrigate	Well	Tracking
	Thile	(inches)	(inches)	Meter	Meter	Stage	1 Foot	2 Feet	3 Feet	4 Feet	5 Feet	Position	crop migute	GPM	Source
03/30		1.44													Pivotrac
04/01		2.23													Pivotrac
04/05		0.48													Pivotrac
04/13	03:30 PM			256.844	30477.2		90.1	97.7	97.3	95.0	92.8	184		off	C & L
04/17	11:15 AM			256.844								184	start		Pivotrac
04/17	08:05 PM		0.08	257.542								210	into 4	320	Pivotrac
04/18	01:40 PM			258.587								240	into 5	320	Pivotrac
04/19	07:15 AM			259.629								270	into 3	320	Pivotrac
04/21		0.90													Pivotrac
04/24	03:30 PM		0.90	267.230								210	into 4	320	Pivotrac
04/25	06:05 AM			268.095								240	into 5	320	Pivotrac
04/25	07:35 PM			268.895								270	into 3	320	Pivotrac
	07:50 AM		0.15	270.137								296	stop	320	Pivotrac
04/26		0.44										296	move dry		Pivotrac
04/30		1.39													Pivotrac
05/03		0.34													Pivotrac
05/10		0.47													Pivotrac
05/16		0.19													Pivotrac
	03:05 PM											350	move dry		Pivotrac
05/22		0.73													Pivotrac
05/27						plant						356	move dry		Harold
	12:30 pm					pain						355	start cw		Pivotrac
	09:05 am		0.31	272.780								210	into 4	320	Pivotrac
	03:30 pm		0.51	273.160								240	into 5	320	Pivotrac
	09:45 pm			273.531								270	into 3	320	Pivotrac
	10:00 am			275.551								80	stop	520	Pivotrac
	03:45 pm											80	start cw		Pivotrac
	06:35 pm		0.52	277.981								210	into 4	320	Pivotrac
	08:30 am		0.52	278.806								240	into 4	320	Pivotrac
	10:25 pm			279.631								240	into 3	320	Pivotrac
	11:10 am			279.375	30942.2	emerged	22.5	97.7	97.6	97.8	352	3	3	320	Curtis
	09:50 pm			219.313	30942.2	emergeu	22.5	91.1	97.0	97.0	552	14	stop	320	Pivotrac
	10:40 am											14	stop start cw		Pivotrac
	07:45 am		0.95	287.697								210	into 4	310	Pivotrac
	07:45 am 09:45 pm		0.95	287.097								240	into 4	310	Pivotrac
	11:30 am			287.234	31074.7	2 leaf	20.1	98.6	98.5	98.7	269	240	5	310	Curtis
	11:50 am			288.506	51074.7	2 leai	20.1	96.0	90.5	90.7	209	209	into 3	312	Pivotrac
	07:35 am		0.95	296.529								210	into 3	310	Pivotrac
	07:35 am 09:40 pm		0.95	290.329								240	into 4	310	Pivotrac
	11:40 am			298.141								240	into 3	310	Pivotrac
	04:40 pm				31247.8	4 leaf	101	101	100	100	100	270	3	310	Curtis
	04:40 pm 08:35 pm			297.039	31247.0		101	101	100	100	100	186		510	Pivotrac
	11:00 am	1 41		303.907	31372.4	hail 6 leaf	98.2	97.8	97.7	97.7			stop		Curtis
		1.41		303.907	313/2.4	6 leaf	98.2	97.8	91.1	91.1		186	stop		
	07:15 pm		0.05	206 121			<u> </u>					186	srart cw	210	Pivotrac Divotrac
	05:10 am		0.95	306.121			<u> </u>					210	into 4	310	Pivotrac
	09:15 pm			307.044			<u> </u>					240	into 5	310	Pivotrac
	12:35 pm	0.90		307.925	21550.0	71	08.0	08.7	09.1	00.0	00.0	270	into 3	310	Pivotrac
	11:45 am	0.80	0.05	314.331	31559.0	7 leaf	98.9	98.7	98.1	98.8	98.8	196	3	302	Curtis
	01:15 pm		0.95	315.962								210	into 4	300	Pivotrac
	07:55 am			317.00								240	into 5	300	Pivotrac
	05:15 am			318.129	01/70 -	01.0	00.7	00.0	06.1	00.0	00.0	270	into 3	300	Pivotrac
	11:40 am		0	320.746	31678.8	8 leaf	99.3	98.8	98.1	99.0	98.8	152	3	292	Curtis
	02:05 pm		0.72	324.231								210	into 4	300	Pivotrac
	08:20 am			325.245								240	into 5	300	Pivotrac
	06:15 am			326.463				0.7	0.7	0.7	0- 1	270	into 3	300	Pivotrac
	11:30 am			329.579	31846.4	10 leaf	96.0	98.9	98.2	99.1	99.0	137	3	276	Curtis
07/19	08:00 pm		0.80	333.276								210	into 4	275	Pivotrac

Table 15: 2017 Field Data, "3 GPM" LEPA Shroud Corn, 236 bu/ac, Grall

Date Pain Rainfall lingingingingingingingingingingingingingi			Rainfall	Irrigation	Water	Hour	Growth	wth Soil Moisture							Well	Tracking
01720 0:220 pm 333 209 3210 2 1 1 1 1 1 1 1 270 10:03 275 Protrace 0721 01:040 pm 335.308 2012.6 tassle 47.4 97.4 98.0 98.8 98.8 124 3<	Date	Time						1 Foot				5 Eeet		Crop Irrigate		
0721 01:40 pm 335.398 0 0 0 270 01:00 m 275 Produe 0727 01:30 am 0.79 342.112 baske 47.4 97.4 98.8 98.8 98.8 120 into 4 275 Pivotras 0727 01:35 pm 343.03 0 0 0.8 98.8 98.8 120 into 4 275 Pivotras 0803 68.40 am 0.83 351.035 0 0 2.00 into 5 275 Pivotras 0804 0.410 am 0.83 351.035 0 0 2.00 into 5 275 Pivotras 0804 0.410 am 0.83 352.032 0 0 0 2.00 into 5 275 Pivotras 0807 0.45 am 355.032 2.04 8.0 9.8 9.8 9.8 9.8 9.8 9.8 9.8 9.8 9.8 9.8 9.8 9.8 9.9 Pivotras	07/20	02·20 pm	(menes)	(inches)		meter	Stuge	1 1 000	2 1000	5100	4 1000	5 100		into 5		
0725 UC2 and 0727 0120 and 0727 0120 and 0728 0120 and 0729 0120 and 0728 0200 and 0728 0200 and 0728 0210 and 0729 0210 and 0729 <td></td> <td>1</td> <td></td>		1														
0121 0130 am 0.79 342.112 m m m 210 min0.5 275 Pivotrac 07121 07.35 pm 343.033 m 0.81 340.03 min0.5 275 Pivotrac 08030 8840 am 0.82 351.035 m m 210 inito 4 275 Pivotrac 08030 8840 am 0.82 351.035 m m 210 inito 4 275 Pivotrac 08040 041.5 am 2.58 334.935 322.00 bikser 98.7 98.6 98.7 99.01 61 4.w 276 inito 5 275 Pivotrac 08070 10.43 am m m m 87.7 98.6 98.7 99.1 80 3.w 244 stotp Pivotrac 08071 10.55 m m m m m m m m m Pivotrac 08111 10.55 m m m		-				32012.6	tassle	47 A	974	98.0	98.8	98.8				
0727 0725 0725 0725 944.103 0 0 2 0 10.05 275 Pivotace 0803 0.430 0.083 31.035 0 0 0 0.023 0.023 0.023 0.021 0.010 0.027 Pivotace 0803 1.235 pm 2.58 343.035 2.02 bitsor 98.0 98.6 98.7 99.2 99.1 21.6 4.cw 27.0 bitoto 27.5 Pivotace 0800 0.415 am 0 0 0.0 0.0 0.0 1.05 statt cm Pivotace 0800 0.425 pm 0 0 0 0 0.0 0.0 Pivotace 2.0 1.60 0.0 Pivotace 0811 0.10 0.7 78.76 3.247.2 milk 98.5 98.7 98.5 2.40 off Caris 0811 1.105 pm 300.523 D 0 0.0 2.24 off C				0.79		52012.0	tussie		77.4	70.0	70.0	70.0				
0728 04:35 µm 0.82 371.03 0.75 Pivotrac 0803 08:40 µm 0.82 351.035 0 0 0 210 into 3 275 Pivotrac 0804 04:15 µm 0.82 340.366 322.02 0 <t< td=""><td></td><td></td><td></td><td>0.77</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></t<>				0.77												
08:00 08:94) am 0.82 51.05 m m m m m model																
0803 2-35 pm 2.58 349.356 322.09 bilser 98.7 98.6 98.7 99.2 99.1 21.6 4 cw 77.6 Curins 0804 04.15 am 320.02 20 100.5 27.5 Pivotrac 0807 0425 am 20 10.5 Start cw Pivotrac 0807 0425 am 355.294 32347.9 bilster 98.7 98.6 98.7 99.2 99.1 80 3ccw 264 Curins 0801 04.10 am 0.77 359.57 2 2.24 Stort ow Pivotrac 0811 10.12 mm 360.523 2 2.24 Stort ow Pivotrac 0822 0435 pm 0.11 365.215 3254.1.4 dough 98.2 98.3 98.4 98.2 100 3.3 250 Pivotrac 0823 050.00 365.215 3254.1.4 dough <td></td> <td></td> <td></td> <td>0.82</td> <td></td>				0.82												
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0805 01-94 am Image: margine		1	2.30			52250.9	Ulister	90.7	90.0	90.7	<i>уу.</i> 2	<i>yy</i> .1				
08:07 04:25 am 0 0 0 0 0 0 15 stop Pivotrac 08:00 0:55 am 0.66 355.294 32:47.9 bilser 98.7 98.6 99.7 99.2 91.1 80 3 car CA Pivotrac 08:11 01:25 pm 0.36 355.294 32:47.9 bilser 98.5 98.4 99.5 224 otto Curits Pivotrac 08:16 04:35 pm 4.77 358.764 32:41.2 milk 98.5 98.4 98.5 98.4 98.5 224 otto Curits 08/17 1105 pm 358.764 32:41.4 dough 98.2 98.2 98.3 98.4 98.2 110 33 250 Pivotrac 08/23 10:55 am - 60:00 pm 36:530 - - 0 0 134 start Pivotrac 08/23 10:55 am - 370:613 - - <					352.052											
08:07 10:55 am 0.36 35.294 325.47.9 bilser 98.7 98.6 98.7 99.2 99.1 80 3 cw 264 Curits 08/11 01:25 pm - 77 359.597 - - 224 stop Pivotrac 08/11 01:25 pm - 77 358.976 324.17.2 milk 98.5 98.7 98.5 224 stop Pivotrac 08/11 01:45 pm 4.77 358.976 324.17.2 milk 98.5 98.7 98.5 224 stop Pivotrac 08/17 11:05 pm - 360.523 - - 6 240 into 3 250 Pivotrac 08/21 05:50 m - 360.513 3251.4 dough 98.2 98.2 98.4 98.2 10.4 stop Pivotrac 08/23 05:50 m - 360.513 - - - 240 into 4 250 Pivotrac															215	
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11/07 Image: Constraint of the constra	_															
11/14 01:00 PM 398.178 33206.6 harvested 97.4 97.7 97.9 98.2 98.1 10 off Curtis Total 11.08 13.08 0 0 0.0 0.0 0.0 0.0 0.0 0.0 e 0.0 Soil Moisture 283 GPM Leon Net soil moisture is 0.00 inches. Rainfall (11.08 in), irrigation (13.08 in), and net soil moisture (0.00 in) is total water (24.16 in). E		51.05 I WI			570.170	55200.0		70.7	71.2	71.5	1.5	71.7				
Total 11.08 13.08 0.0 0.0 0.0 0.0 0.0 0.0 e = 0.0 Soil Moisture 283 GPM Leon Net soil moisture is 0.00 inches. Rainfall (11.08 in), irrigation (13.08 in), and net soil moisture (0.00 in) is total water (24.16 in). 0.0 0.0 0.0 0.0 0.0 0.0 0.0 283 GPM Leon		01:00 PM			398 178	33206.6		97 4	97 7	97 9	98.2	98.1				
Net soil moisture is 0.00 inches. Rainfall (11.08 in), irrigation (13.08 in), and net soil moisture (0.00 in) is total water (24.16 in).	-		11.08	13.08	570.170	55200.0	nui vostett								283 GPM	· · · · · · · · · · · · · · · · · · ·
Rainfall (11.08 in), irrigation (13.08 in), and net soil moisture (0.00 in) is total water (24.16 in).						l	Ι	0.0	0.0	0.0	0.0	0.0	- 0.0	Son moisture	205 01 11	Leon
					n), and pe	t soil mois	ture (0.00 in) is tot	al wate	r (74 1	6 in)					
			<u> </u>					, 10 101	ar wate	• (<u></u> ,1	<u>с ш</u>					

Table 15: 2017 Field Data, "3 GPM" LEPA Shroud Corn, 236 bu/ac, Grall (continued)

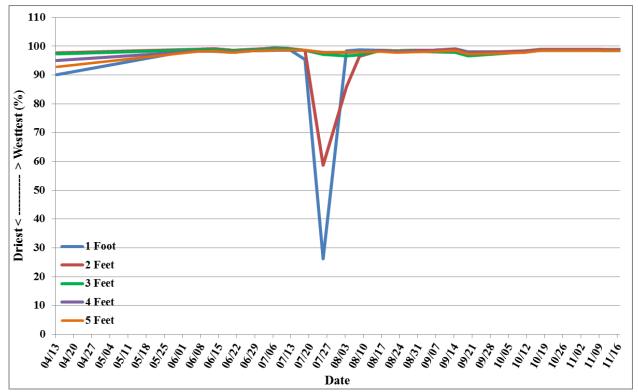
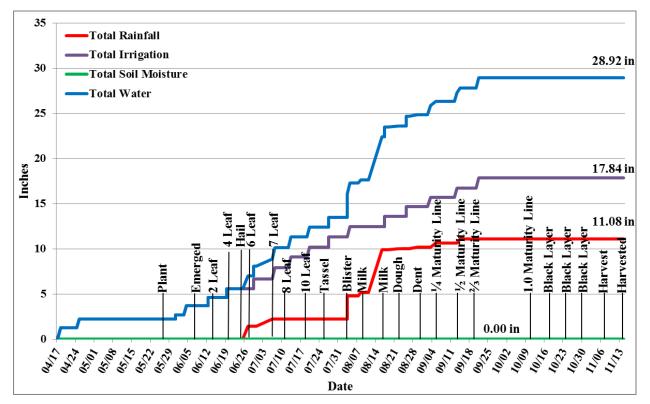


Figure 18: 2017 Gypsum Block Readings, "4 GPM" LEPA Shroud Corn, 240 bu/ac, Grall

Figure 19: 2017 Growing Season Water Tracking, "4 GPM" LEPA Shroud Corn, 240 bu/ac, Grall



		Rainfall	Irrigation	Water	Hour	Growth		So	il Moist	ure		Pivot		Well	Tracking
Date	Time	(inches)	(inches)	Meter	Meter	Stage	1 Foot		3 Feet		5 Feet		Crop Irrigate	(GPM)	Source
03/30		1.44	(menes)		interer	Stuge	11000	21000	51000	+1000	51000	1 00111011		(01111)	Pivotrac
04/01		2.23													Pivotrac
04/01		0.48													Pivotrac
04/03	03:30 PM	0.40		256.844	30477.2		90.1	97.7	97.3	95.0	92.8	184		off	C & L
04/13	11:15 AM			256.844	50477.2		70.1	71.1	71.5	75.0	72.0	184	start	011	Pivotrac
04/17	08:05 PM			257.542								210	into 4	320	Pivotrac
04/17	01:40 PM		1.23	258.587								240	into 4	320	Pivotrac
-	07:15 AM		1.23	259.629								270	into 3	320	Pivotrac
04/1)	07.137101	0.90		257.027								270	into 5	520	Pivotrac
04/21	03:30 PM	0.90		267.230								210	into 4	320	Pivotrac
04/24	06:05 AM		1.02	268.095								240	into 4	320	Pivotrac
04/25	07:35 PM		1.02	268.895								270	into 3	320	Pivotrac
04/25	07:50 AM			270.137								296	stop	320	Pivotrac
04/26	07.507101	0.44		270.137								296	move dry	520	Pivotrac
04/20		1.39										270	move dry		Pivotrac
05/03		0.34													Pivotrac
05/10		0.47													Pivotrac
05/10		0.47													Pivotrac
05/18	03:05 PM	0.17										350	move dry		Pivotrac
05/22	03.03 F M	0.73										550	move dry		Pivotrac
05/22		0.75				plant						356	move dry		Harold
05/27	12:30 PM					plan						355	ţ		Pivotrac
05/31	09:05 AM			272.780								210	start into 4	320	Pivotrac
05/31	03:30 PM		0.45	272.780								240	into 4	320	Pivotrac
05/31	09:45 PM		0.43	273.531								240	into 3	320	Pivotrac
05/31	10:00 AM			275.551								80		520	Pivotrac
06/02	03:45 PM											80	stop		Pivotrac
06/02	06:35 PM			277 091								210	start into 4	320	Pivotrac
06/03	08:30 AM		0.98	277.981 278.806								240	into 4		Pivotrac
06/04	10:25 PM		0.98	279.631								240	into 3	320 320	Pivotrac
06/04	10.23 FM 11:10 AM			279.031	30942.2	emerged	98.9	98.9	98.7	98.2	98.1	352	3	320	Curtis
06/06	09:50 PM			219.515	30942.2	emerged	98.9	98.9	96.7	96.2	96.1	14		520	Pivotrac
06/08	10:40 AM											14	stop start		Pivotrac
06/08	07:45 AM			287.697								210	into 4	310	Pivotrac
06/12	07:45 AM		0.95	287.097								240	into 4	310	Pivotrac
06/12	11:30 AM		0.95		31074.7	2 leaf	99.0	99.0	98.8	98.2	98.2	240	5	310	Curtis
06/13	11:50 AM			287.234	510/4.7	2 leai	99.0	99.0	90.0	90.2	90.2	209	into 3	312	Pivotrac
06/13	07:35 AM			296.529								210	into 3	310	Pivotrac
06/19	07.33 AM 09:40 PM		0.95	290.329								240	into 4	310	Pivotrac
	11:40 AM		0.93	297.557								240	into 3	310	Pivotrac
	04:40 PM				31247.8	4 leaf	98.5	98.6	98.3	97.9	97.8	280	3	310	Curtis
	04:40 PM 08:35 PM			291.039	51247.0	hail	20.5	20.0	70.5	71.7	71.0	186	stop	510	Pivotrac
06/23	11:00 AM			303 007	31372.4	6 leaf	98.8	98.9	98.7	98.3	98.2	186	stop		Curtis
06/27	07:15 PM	1.41		505.907	51512.4	0 ICal	70.0	70.7	70.7	10.3	70.2	186	ctort		Pivotrac
06/28	07:15 PM 05:10 AM			306.121								210	start into 4	310	Pivotrac
06/29	09:15 PM		1.09	307.044								240	into 4	310	Pivotrac
-	12:35 PM		1.09	307.044								240	into 3	310	Pivotrac
	12:35 PM 11:45 AM	0.80			31559.0	7 leaf	99.4	99.3	99.1	98.6	98.6	196	1110 S	302	Curtis
	01:15 PM	0.80		314.331	51559.0	/ leal	77.4	37.5	77.1	70.0	70.0	210	3 into 4	302	
	01:15 PM 07:55 AM		1.02												Pivotrac Pivotrac
			1.23	317.00								240	into 5	300	Pivotrac
-	05:15 AM			318.129	21670.0	0 1£	00.2	00.2	00.0	08 6	08.6	270	into 3	300	Pivotrac
-	11:40 AM				31678.8	8 leaf	99.3	99.3	99.0	98.6	98.6	152	3	292	Curtis
07/12	02:05 PM		1.20	324.231							L	210	into 4	300	Pivotrac
	08:20 AM		1.20	325.245								240	into 5	300	Pivotrac
	06:15 AM			326.463	21046.4	10.1 5	05.2	00 1	00.7	00 5	00 5	270	into 3	300	Pivotrac
07/18	11:30 AM				31846.4	10 leaf	95.3	98.6	98.5	98.6	98.6	137	3	276	Curtis
07/19	08:00 PM			333.276								210	into 4	275	Pivotrac

Table 16: 2017 Field Data, "4 GPM" LEPA Shroud Corn, 240 bu/ac, Grall

		Rainfall	Irrigation	Water	Hour	Growth		So	il Moist	ure		Pivot		Well	Tracking
Date	Time	(inches)	(inches)	Meter	Meter		1 Foot	2 Feet			5 Feet	Position	Crop Irrigate	(GPM)	Source
07/20	02:20 PM	(1.10	334.209		~ 1181	11000	21000	0 1 000		0 1 000	240	into 5	275	Pivotrac
07/21	01:40 PM			335.398								270	into 3	275	Pivotrac
07/25	10:20 AM				32012.6	tassle	26.1	58.6	97.1	97.8	97.8	124	3	281	Paul
07/27	01:30 AM			342.112					,,,,,	,,,,,	,	210	into 4	275	Pivotrac
07/27	07:35 PM		1.09	343.033								240	into 5	275	Pivotrac
07/28	04:35 PM			344.103								270	into 3	275	Pivotrac
08/03	08:40 AM			351.035								210	into 4	275	Pivotrac
08/03	12:35 PM	2.58			32230.9	blister	98.3	85.8	96.6	97.9	97.9	216	4	276	Curtis
08/02	04:15 AM	2.00	1.18	352.032	022000	onoter	7010	0010	2010	,,	,	240	into 5	275	Pivotrac
08/05	01:40 AM			353.114								270	into 3	275	Pivotrac
08/03	04:25 AM			555.111								15	stop	210	Pivotrac
08/07	10:55 AM											15	stop		Pivotrac
08/08	03:55 PM	0.36		355 294	32347.9	milk	98.7	96.4	97.0	98.0	97.9	80	3	264	Curtis
08/11	03:33 I M 04:10 AM	0.50		359.597	52541.7	IIIIK	70.7	70.4	77.0	70.0	71.7	210	into 4	250	Pivotrac
08/11	01:25 PM			339.391								210		250	Pivotrac
08/11	04:45 PM	4.77		358 764	32417.2	milk	98.6	98.5	98.4	98.3	98.1	224	stop off		Curtis
08/10	12:20 PM	4.77		556.704	52417.2	ШК	90.0	90.5	90.4	90.5	90.1	224	start		Pivotrac
08/17	12:20 PM		1.10	360.523								240	into 5	250	Pivotrac
08/17	08:50 PM		1.10	361.530								240	into 3	250	Pivotrac
		0.11			22541.4		00.2	00.2	00.2	00.1	07.0				
08/22	04:35 PM	0.11		305.215	32541.4	dough	98.3	98.3	98.2	98.1	97.8	110	3	265	Curtis
08/23	05:00 AM											134	stop		Pivotrac
08/23	10:55 AM			260,622								134	start	250	Pivotrac
08/25	12:10 AM		1.00	368.633								210	into 4	250	Pivotrac
08/25	06:00 PM		1.09	369.552								240	into 5	250	Pivotrac
08/26	04:55 PM	0.10		370.613	22 600 1		00.5	00.5	00.0	00.0	00.0	270	into 3	250	Pivotrac
08/29	12:40 PM	0.12			32699.4	dent	98.5	98.5	98.3	98.2	98.0	58	3	268	Curtis
09/01	10:25 AM			376.980								210	into 4	250	Pivotrac
09/02	05:25 AM			377.860								240	into 5	250	Pivotrac
09/03	03:05 AM		1.04	378.863								270	into 3	250	Pivotrac
09/05	03:40 PM	0.46		381.657	32870.5	¼ mat line	98.6	98.6	98.1	98.3	98.1	42	3	266	Curtis
09/08	10:00 AM											185	3		Pivotrac
09/11	04:10 PM											185	start		Pivotrac
09/12	05:05 AM			385.597								210	into 4	260	Pivotrac
09/12	10:25 PM			386.431								240	into 5	260	Pivotrac
09/13	08:50 PM		0.99	387.511								270	into 3	260	Pivotrac
09/14	03:20 PM	0.47		388.524	33007.8	1/2 mat line	99.0	98.9	97.8	98.4	98.4	311	3	272	Curtis
09/19	09:55 AM			394.122	33122.4	⅔ mat line	98.0	97.7	96.6	97.4	97.3	197	3	256	Curtis
09/19	04:00 PM			394.470								210	into 4	270	Pivotrac
09/20	11:30 AM			395.445								240	into 5	270	Pivotrac
09/21	08:30 AM		1.15	396.496								270	into 3	270	Pivotrac
09/22	08:30 PM			398.296								347	stop	270	Pivotrac
10/11	03:25 AM	5.72		398.178	33204.8	1.0 mat line	98.1	98.3	98.1	98.0	97.8	347	off		Curtis
10/17	03:45 AM			398.178	33204.8	black layer	98.7	98.9	98.6	98.5	98.4	347	off		Curtis
10/24	03:50 PM			398.178	33204.8	black layer	98.3	98.4	97.9	98.0	98.0	347	off		Curtis
10/30	03:50 PM			398.178	33204.8	black layer	97.5	97.6	97.3	97.4	97.3	347	off		Curtis
11/07	01:05 PM			398.178	33206.6	black layer	97.6	97.8	97.4	97.3	97.4	347	off		Curtis
11/07						harvest						move dry			Harold
11/14	01:00 PM			398.178	33206.6	harvested	97.9	98.0	97.9	97.6	97.7	10	off		Curtis
Total		11.08	17.84				0.0	0.0	0.0	0.0	0.0	= 0.0	Soil Moisture	283 GPM	1
Net soil r	noisture is ().00 inche	s.	-			_		_						
Rainfall (11.08 in), i	rrigation (1	17.84 in), a	und net soi	l moisture	(0.00 in) is	total wa	ater (28	.92 in).						
<u> </u>	rs in red are	0	· · · ·			,		`	,						

Table 16: 2017 Field Data, "4 GPM" LEPA Shroud Corn, 240 bu/ac, Grall (continued)

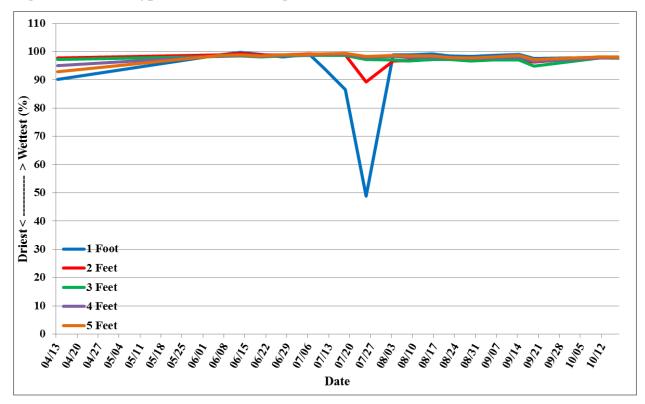
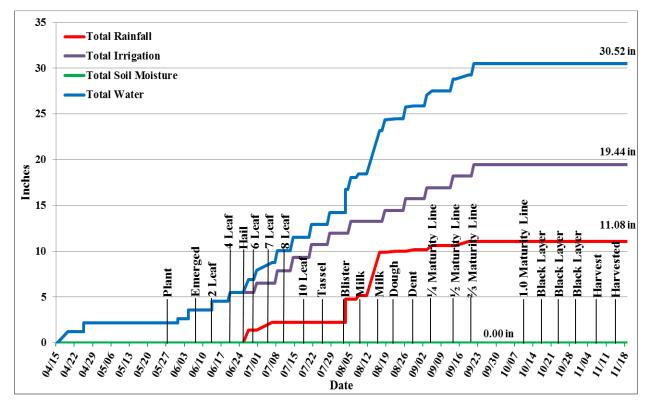


Figure 20: 2017 Gypsum Block Readings, "5 GPM" LEPA Shroud Corn, 237 bu/ac, Grall

Figure 21: 2017 Growing Season Water Tracking, "5 GPM" LEPA Shroud Corn, 237 bu/ac, Grall



-		Rainfall	Irrigation	Water	Hour	Growth	[Soi	il Moist	ure		Pivot	a	Well	Tracking
Date	Time	(inches)	(inches)	Meter	Meter	Stage	1 Foot	2 Feet	3 Feet	4 Feet	5 Feet	Position	Crop Irrigate	(GPM)	Source
03/30		1.44				0								. ,	Pivotrac
04/01		2.23													Pivotrac
04/05		0.48													Pivotrac
04/13	03:30 PM			256.844	30477.2		90.1	97.7	97.3	95.0	92.8	184		off	C & L
04/17	11:15 AM			256.844								184	start		Pivotrac
04/17	08:05 PM			257.542								210	into 4	320	Pivotrac
04/18	01:40 PM			258.587								240	into 5	320	Pivotrac
04/19	07:15 AM		1.23	259.629								270	into 3	320	Pivotrac
04/21		0.90													Pivotrac
04/24	03:30 PM			267.230								210	into 4	320	Pivotrac
04/25	06:05 AM			268.095								240	into 5	320	Pivotrac
04/25	07:35 PM		0.95	268.895								270	into 3	320	Pivotrac
04/26	07:50 AM			270.137								296	stop	320	Pivotrac
04/26		0.44										296	move dry		Pivotrac
04/30		1.39											, i i i i i i i i i i i i i i i i i i i		Pivotrac
05/03		0.34													Pivotrac
05/10		0.47													Pivotrac
05/16		0.19													Pivotrac
05/18	03:05 PM											350	move dry		Pivotrac
05/22		0.73											· · · · ·		Pivotrac
05/27						plant						356	move dry		Harold
05/29	12:30 PM					•						355	start		Pivotrac
05/31	09:05 AM			272.780								210	into 4	320	Pivotrac
05/31	03:30 PM			273.160								240	into 5	320	Pivotrac
05/31	09:45 PM		0.44	273.531								270	into 3	320	Pivotrac
06/02	10:00 AM											80	stop		Pivotrac
06/02	03:45 PM											80	start		Pivotrac
06/03	06:35 PM			277.981								210	into 4	320	Pivotrac
06/04	08:30 AM			278.806								240	into 5	320	Pivotrac
06/04	10:25 PM		0.98	279.631								270	into 3	320	Pivotrac
06/06	11:10 AM			279.375	30942.2	emerged	98.9	98.8	98.3	98.4	98.7	352	3	320	Curtis
06/06	09:50 PM											14	stop		Pivotrac
06/08	10:40 AM											14	start		Pivotrac
06/12	07:45 AM			287.697								210	into 4	310	Pivotrac
06/12	09:45 PM			288.501								240	into 5	310	Pivotrac
06/13	11:30 AM			287.234	31074.7	2 leaf	99.7	99.3	98.5	98.7	98.9	269	5	312	Curtis
06/13	11:50 AM		0.95	288.506								270	into 3	310	Pivotrac
06/19	07:35 AM			296.529								210	into 4	310	Pivotrac
06/19	09:40 PM			297.337								240	into 5	310	Pivotrac
06/20	11:40 AM		0.95	298.141								270	into 3	310	Pivotrac
06/20	04:40 PM			297.059	31247.8	4 leaf	99.0	98.8	98.2	98.3	98.5	280	3	310	Curtis
06/25	08:35 PM					hail						186	stop		Pivotrac
06/27	11:00 AM	1.41		303.907	31372.4	6 leaf	98.1	98.9	98.4	98.6	98.8	186	start		Curtis
06/28	07:15 PM											186	start		Pivotrac
06/29	05:10 AM			306.121								210	into 4	310	Pivotrac
06/29	09:15 PM			307.044								240	into 5	310	Pivotrac
06/30	12:35 PM		1.04	307.925								270	into 3	310	Pivotrac
07/06	11:45 AM	0.80		314.331	31559.0	7 leaf	99.0	99.2	98.7	98.9	99.1	196	3	302	Curtis
07/06	01:15 PM			315.962								210	into 4	300	Pivotrac
07/07	07:55 AM			317.00								240	into 5	300	Pivotrac
07/08	05:15 AM		1.34	318.129								270	into 3	300	Pivotrac
07/11	11:40 AM				31678.8	8 leaf	94.2	99.1	98.7	99.0	99.2	152	3	292	Curtis

Table 17: 2017 Field Data, "5 GPM" LEPA Shroud Corn, 237 bu/ac, Grall

	1	Dainfall	Irrigation	Water	Hour	Growth		So	il Moist	1170		Pivot		Well	Tracking
Date	Time	(inches)	(inches)	Meter	Meter	Stage	1 Foot		-	4 Feet	5 Eeet	Position	Crop Irrigate	(GPM)	Source
07/12	02:05 PM	(menes)	(inclies)	324.231	Wieter	Stage	I FOOL	Z reet	5 reet	4 reei	5 reet	210	into 4	300	Pivotrac
07/12	02:03 PM 08:20 AM			325.245								240	into 4	300	Pivotrac
07/13			1.44									240		300	
07/14	06:15 AM 11:30 AM		1.44	326.463 329.579	21946 4	10 leaf	86.6	98.8	98.7	99.0	99.3	137	into 3 3	276	Pivotrac Curtis
07/18	08:00 PM			333.276	51640.4	10 leai	80.0	90.0	90.7	99.0	<i>99.3</i>	210	into 4	270	Pivotrac
07/20	03:00 I M 02:20 PM			334.209								240	into 4	275	Pivotrac
07/20	01:40 PM		1.41	335.398								240	into 3	275	Pivotrac
07/21	10:20 AM		1.41	338.206	32012.6	tassle	48.8	89.3	97.3	98.0	98.3	124	3	275	Paul
	01:30 AM			342.112	32012.0	tussie	40.0	07.5	71.5	70.0	70.5	210	into 4	275	Pivotrac
07/27	07:35 PM			343.033								240	into 4	275	Pivotrac
07/28	04:35 PM		1.27	344.103								270	into 3	275	Pivotrac
08/03	08:40 AM		1127	351.035								210	into 4	275	Pivotrac
08/03	12:35 PM	2.58		349.356	32230.9	blister	98.9	96.7	97.1	98.3	98.7	216	4	276	Curtis
	04:15 AM	2.00		352.032	022000	onster	7017	2017	<i>,</i> ,,,,	70.0	2017	240	into 5	275	Pivotrac
	01:40 AM		1.28	353.114								270	into 3	275	Pivotrac
	04:25 AM											15	stop		Pivotrac
08/07	10:55 AM											15	start		Pivotrac
08/08	03:55 PM	0.36		355.294	32347.9	milk	98.9	96.9	96.6	97.9	98.5	80	3	264	Curtis
08/11	04:10 AM			359.597								210	into 4	250	Pivotrac
08/11	01:25 PM											224	stop		Pivotrac
08/16	04:45 PM	4.77		358.764	32417.2	milk	99.2	97.2	97.3	98.0	98.4	224	off		Curtis
08/17	12:20 PM											224	start		Pivotrac
08/17	11:05 PM			360.523								240	into 5	250	Pivotrac
08/18	08:50 PM		1.19	361.530								270	into 3	250	Pivotrac
08/22	04:35 PM	0.11		365.215	32541.4	dough	98.5	97.4	97.2	97.7	98.0	110	3	265	Curtis
08/23	05:00 AM											134	stop		Pivotrac
08/23	10:55 AM											134	start		Pivotrac
08/25	12:10 AM			368.633								210	into 4	250	Pivotrac
08/25	06:00 PM			369.552								240	into 5	250	Pivotrac
08/26	04:55 PM		1.26	370.613								270	into 3	250	Pivotrac
08/29	12:40 PM	0.12		373.201	32699.4	dent	98.3	97.3	96.7	97.5	97.8	58	3	268	Curtis
09/01	10:25 AM			376.980								210	into 4	250	Pivotrac
09/02	05:25 AM			377.860								240	into 5	250	Pivotrac
09/03	03:05 AM		1.19	378.863								270	into 3	250	Pivotrac
09/05	03:40 PM	0.46		381.657	32870.5	¼ mat line	98.7	97.0	97.0	97.8	98.2	42	3	266	Curtis
09/08	10:00 AM											185	3		Pivotrac
09/11	04:10 PM											185	start		Pivotrac
09/12	05:05 AM			385.597								210	into 4	260	Pivotrac
	10:25 PM			386.431								240	into 5	260	Pivotrac
	08:50 PM		1.28	387.511								270	into 3	260	Pivotrac
09/14	03:20 PM					1/2 mat line	99.0	97.0	97.0	98.0	98.6	311	3	272	Curtis
	09:55 AM	0.47		394.122	33122.4	⅔ mat line	97.6	96.3	94.9	96.5	97.2	197	3	256	Curtis
09/19	04:00 PM			394.470								210	into 4	270	Pivotrac
	11:30 AM			395.445								240	into 5	270	Pivotrac
	08:30 AM		1.24	396.496								270	into 3	270	Pivotrac
09/22	08:30 PM			398.296								347	stop	270	Pivotrac
10/11	03:25 PM	5.72				1.0 mat line		98.1	97.7	97.8	98.1	347	off		Curtis
10/17	03:45 PM					black layer		98.1	98.2	98.3	98.4	347	off		Curtis
10/24	03:50 PM					black layer		98.0	97.5	97.7	98.0	347	off		Curtis
10/30	03:50 PM					black layer		97.6	96.9	97.1	97.5	347	off		Curtis
11/07	01:05 PM			398.178	33206.6	black layer	97.3	97.3	96.6	96.9	97.3	347	off		Curtis
11/07						harvest						move dry			Harold
11/14	01:00 PM			398.178	33206.6	harvested	97.7	97.0	97.1	97.4	97.8	10	off		Curtis
Total		11.08	19.44				0.0	0.0	0.0	0.0	0.0	= 0.0	Soil Moisture		Leon
	noisture is (
-						e (0.00 in) is	total w	ater (3	0.52 in)).					
*Number	s in red are	not count	ted in the t	otal rainfa	Ш.										

Table 17: 2017 Field Data, "5 GPM" LEPA Shroud Corn, 237 bu/ac (continued), Grall

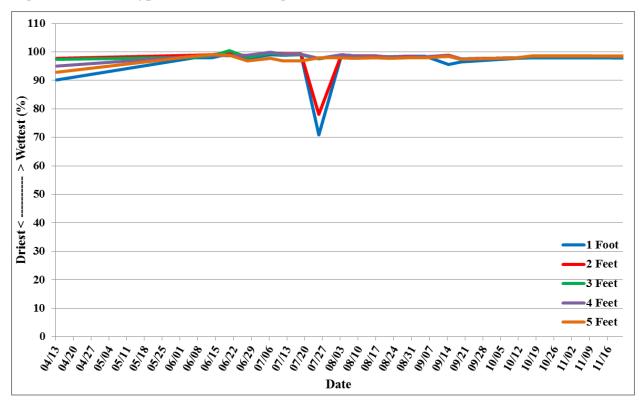
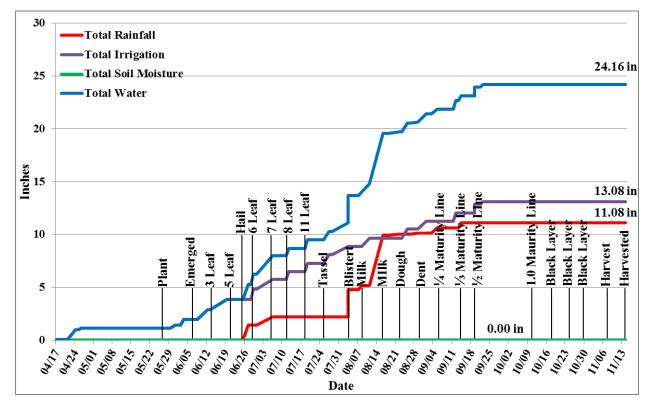


Figure 22: 2017 Gypsum Block Readings, "3 GPM" PMDI Corn, 221 bu/ac, Grall

Figure 23: 2017 Growing Season Water Tracking, "3 GPM" PMDI Corn, 221 bu/ac, Grall



		Rainfall	Irrigation	Water	Hour	Growth		So	il Moist	ure		Pivot	~ · ·	Well	Tracking
Date	Time	(inches)	(inches)	Meter	Meter	Stage	1 Foot	2 Feet	3 Feet	4 Feet	5 Feet	Position	Crop Irrigate	(GPM)	Source
03/30		1.44													Pivotrac
04/01		2.23													Pivotrac
04/05		0.48													Pivotrac
04/13	03:30 PM			256.844	30477.2		90.1	97.7	97.3	95.0	92.8	184		off	C & L
04/17	11:15 AM			256.844								184	start		Pivotrac
04/17	08:05 PM		0.08	257.542								210	into 4	320	Pivotrac
04/18	01:40 PM			258.587								240	into 5	320	Pivotrac
04/19	07:15 AM			259.629								270	into 3	320	Pivotrac
04/21		0.90													Pivotrac
04/24	03:30 PM		0.90	267.230								210	into 4	320	Pivotrac
04/25	06:05 AM			268.095								240	into 5	320	Pivotrac
04/25	07:35 PM			268.895								270	into 3	320	Pivotrac
04/26	07:50 AM		0.15	270.137								296	stop	320	Pivotrac
04/26		0.44										296	move dry		Pivotrac
04/30		1.39													Pivotrac
05/03		0.34													Pivotrac
05/10		0.47													Pivotrac
05/16		0.19													Pivotrac
05/18	03:05 PM											350	move dry		Pivotrac
05/22		0.73													Pivotrac
05/27						plant						356	move dry		Harold
05/29	12:30 PM											355	start		Pivotrac
05/31	09:05 AM		0.31	272.780								210	into 4	320	Pivotrac
05/31	03:30 PM			273.160								240	into 5	320	Pivotrac
05/31	09:45 PM			273.531								270	into 3	320	Pivotrac
06/02	10:00 AM											80	stop		Pivotrac
06/02	03:45 PM											80	start		Pivotrac
06/03	06:35 PM		0.52	277.981								210	into 4	320	Pivotrac
06/04	08:30 AM			278.806								240	into 5	320	Pivotrac
06/04	10:25 PM			279.631								270	into 3	320	Pivotrac
06/06	11:10 AM			279.375	30942.2	emerged	98.0	98.9	98.2	98.5	98.4	352	3	320	Curtis
06/06	09:50 PM											14	stop		Pivotrac
	10:40 AM											14	start		Pivotrac
06/12	07:45 AM		0.95	287.697								210	into 4	310	Pivotrac
06/12	09:45 PM			288.501								240	into 5	310	Pivotrac
06/13	11:30 AM			287.234	31074.7	3 leaf	97.9	99.0	98.7	98.9	99.1	269	5	312	Curtis
06/13	11:50 AM			288.506								270	into 3	310	Pivotrac
06/19	07:35 AM		0.95	296.529								210	into 4	310	Pivotrac
06/19	09:40 PM			297.337								240	into 5	310	Pivotrac
06/20	11:40 AM			298.141								270	into 3	310	Pivotrac
06/20	04:40 PM			297.059	31247.8	5 leaf	99.4	99.8	100.5	98.6	98.8	280	3	310	Curtis
06/25	08:35 PM					hail						186	stop		Pivotrac
06/27	11:00 AM	1.41		303.907	31372.4	6 leaf	97.8	98.5	98.2	98.8	96.8	186	start		Curtis
06/28	07:15 PM											186	start		Pivotrac
06/29	05:10 AM		0.95	306.121								210	into 4	310	Pivotrac
06/29	09:15 PM			307.044								240	into 5	310	Pivotrac
06/30	12:35 PM			307.925								270	into 3	310	Pivotrac
07/06	11:45 AM	0.80	0.95	314.331	31559.0	7 leaf	99.0	99.8	99.5	100.0	97.7	196	3	302	Curtis
07/06	01:15 PM			315.962								210	into 4	300	Pivotrac
	07:55 AM			317.00								240	into 5	300	Pivotrac
07/08	05:15 AM			318.129								270	into 3	300	Pivotrac
07/11	11:40 AM			320.746	31678.8	8 leaf	98.9	99.3	99.0	99.2	96.9	152	3	292	Curtis

Table 18: 2017 Field Data, "3 GPM" PMDI Corn, 221 bu/ac, Grall

		Rainfall	Irrigation	Water	Hour	Growth		So	il Moist	ure		Pivot		Well	Tracking
Date	Time	(inches)	(inches)	Meter	Meter	Stage	1 Foot	2 Feet			5 Feet	Position	Crop Irrigate	(GPM)	Source
07/12	02:05 PM	(0.72	324.231		~	11000	21000	0 1 000		0 1 000	210	into 4	300	Pivotrac
07/13	08:20 AM		0172	325.245								240	into 5	300	Pivotrac
07/14	06:15 AM			326.463								270	into 3	300	Pivotrac
	11:30 AM			329.579	31846.4	11 leaf	99.1	99.3	99.0	99.2	96.8	137	3	276	Curtis
07/19	08:00 PM		0.80	333.276								210	into 4	275	Pivotrac
07/20	02:20 PM			334.209								240	into 5	275	Pivotrac
07/21	01:40 PM			335.398								270	into 3	275	Pivotrac
07/25	10:20 AM			338.206	32012.6	tassel	70.9	78.1	97.6	97.8	98.0	124	3	281	Paul
07/27	01:30 AM		0.79	342.112								210	into 4	275	Pivotrac
07/27	07:35 PM			343.033								240	into 5	275	Pivotrac
07/28	04:35 PM			344.103								270	into 3	275	Pivotrac
08/03	08:40 AM		0.82	351.035								210	into 4	275	Pivotrac
08/03	12:35 PM	2.58		349.356	32230.9	blister	98.8	99.1	98.8	99.1	97.9	216	4	276	Curtis
08/04	04:15 AM			352.032								240	into 5	275	Pivotrac
08/05	01:40 AM			353.114								270	into 3	275	Pivotrac
08/07	04:25 AM											15	stop		Pivotrac
08/07	10:55 AM											15	start		Pivotrac
08/08	03:55 PM	0.36		355.294	32347.9	milk	98.5	98.7	98.3	98.6	97.8	80	3	264	Curtis
08/11	04:10 AM		0.77	359.597								210	into 4	250	Pivotrac
08/11	01:25 PM											224	stop		Pivotrac
08/16	04:45 PM	4.77		358.764	32417.2	milk	98.5	98.6	98.3	98.5	98.0	224	off		Curtis
08/17	12:20 PM											224	start		Pivotrac
08/17	11:05 PM			360.523								240	into 5	250	Pivotrac
08/18	08:50 PM			361.530								270	into 3	250	Pivotrac
08/22	04:35 PM	0.11		365.215	32541.4	dough	98.3	98.2	98.0	98.2	97.7	110	3	265	Curtis
08/23	05:00 AM											134	stop		Pivotrac
08/23	10:55 AM											134	start		Pivotrac
08/25	12:10 AM		0.84	368.633								210	into 4	250	Pivotrac
08/25	06:00 PM			369.552								240	into 5	250	Pivotrac
08/26	04:55 PM			370.613								270	into 3	250	Pivotrac
08/29	12:40 PM	0.12		373.201	32699.4	dent	98.5	98.4	98.1	98.3	98.0	58	3	268	Curtis
09/01	10:25 AM		0.75	376.980								210		250	Pivotrac
09/02	05:25 AM			377.860								240		250	Pivotrac
09/03	03:05 AM	0.46		378.863	22070 5	1/ / 1'	00.4	00.2	00.1	00.2	00.0	270		250	Pivotrac
09/05	03:40 PM	0.46		381.657	32870.5	¼ mat line	98.4	98.3	98.1	98.3	98.0	40		250	Pivotrac
	10:00 AM				32870.5							42		266	Curtis
09/11	04:10 PM 05:05 AM		0.90	205 507								185		200	Pivotrac
09/12 09/12			0.80	385.597								210 240		260 260	Pivotrac
	10:25 PM 08:50 PM			386.431 387.511								240		260	Pivotrac Pivotrac
	03:20 PM	0.47			33007.8	⅓ mat line	95.6	98.8	98.4	98.7	98.5	311		200	Curtis
	03.20 PM 09:55 AM	0.47				⁷ 3 mat line ¹ / ₂ mat line	95.0 96.4	98.8 97.6	96.4 97.3	98.7 97.5	98.3 97.4	197		272	Curtis
	09.55 AM 04:00 PM		0.82	394.122	33122.4	72 IIIat IIIIe	90.4	97.0	97.5	97.5	97.4	210		230	Pivotrac
	11:30 AM		0.62	395.445								240		270	Pivotrac
	08:30 AM			396.496								240		270	Pivotrac
09/21	08:30 AM		0.21	398.296								347	stop	270	Pivotrac
10/11	03:25PM		0.21		33204.8	1.0 mat line	97.7	98.0	97.9	98.0	98.0	347	stop	210	Curtis
10/11	03:45 PM					black layer		98.5	98.3	98.5	98.7	347	off		Curtis
10/17	3:50PM					black layer		97.9	97.8	98.0	98.2	347		off	Curtis
10/24	3:50PM					black layer		97.4	97.1	97.4	97.7	347		off	Curtis
11/07	1:05PM					black layer		97.4	96.8	97.4	97.4	347		off	Curtis
11/07	1.001 101			570.170	55204.0	harvest	20.0	//.1	20.0	>1.1	77.7	move dry		011	Harold
11/07	1:00PM			398.178	33204.8		97.2	97.8	97.4	97.7	98.2	10		off	Curtis
Total	1.001 111	11.08	13.08	270.170	22201.0		0.0	0.0	0.0	0.0	0.0	= 0.0	Soil Moisture		Leon
	moisture is				I	ļ	0.0	0.0	0.0	0.0	0.0	- 0.0	Son moisture		Loon
				and net s	oil moistu	re (0.00 in)	is total	water (24.16 ir	1).					
	ers in red a	<u> </u>	· · · · · ·			((4		/					
					100 B										

Table 18: 2017 Field Data, "3 GPM" PMDI Corn, 221 bu/ac, Grall (continued)

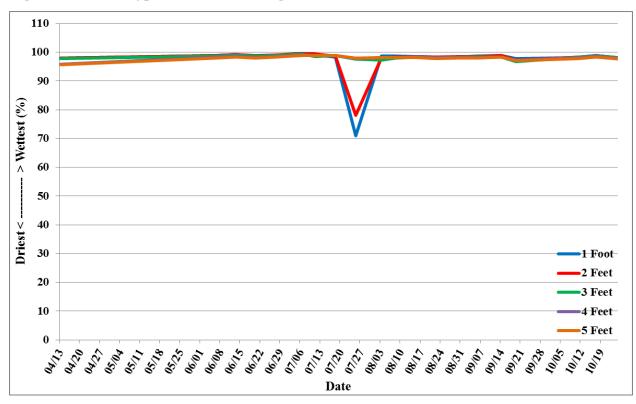
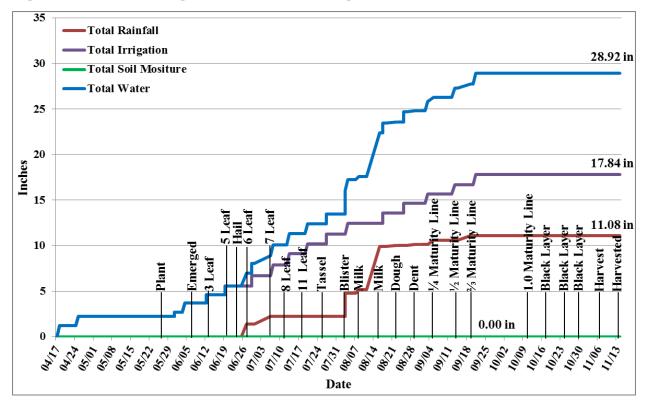


Figure 24: 2017 Gypsum Block Readings, "4 GPM" PMDI Corn, 228 bu/ac, Grall

Figure 25: 2017 Growing Season Water Tracking, "4 GPM" PMDI Corn, 228 bu/ac, Grall



			Irrigation	Water	Hour	Growth	Ĺ		il Moist			Pivot	
Date	Time	(inches)	-	Meter	Meter	Stage	1 Foot				5 Feet	Position	Crop Irrigate
03/30		1.44	(incines)	110001	interer	Stuge	11000	21000	51000	- 1 000	51000	1 00000	
04/01		2.23											
04/05		0.48											
	03:30 PM	0.40		256 844	30477.2		97.9	97.9	97.7	95.8	95.7	184	
04/17	11:15 AM			256.844	50477.2		71.7	,,,,	71.1	75.0	75.1	184	start
04/17	08:05 PM			257.542								210	into 4
04/18	01:40 PM		1.23	258.587								240	into 4
	07:15 AM		1.23	259.629								270	into 3
04/19	07.15 AM	0.90		239.029								270	1110 5
	03:30 PM	0.90		267.230								210	into 4
	06:05 AM		1.02	268.095								240	into 4
	07:35 PM		1.02	268.895								240	into 3
-	07:50 AM			270.137								270	stop
04/20	07.30 AW	0.44		270.137								290	move dry
04/20		1.39										290	move ury
04/30		0.34											
05/05		0.34											
05/10													
05/18	03:05 PM	0.19										350	morro dari
-	05:05 PM	0.72										550	move dry
05/22		0.73				mlant						256	morro dari
05/27	12.20 DM					plant						356 355	move dry
	12:30 PM			070 700									start
	09:05 AM		0.45	272.780								210	into 4
	03:30 PM		0.45	273.160								240	into 5
05/31	09:45 PM			273.531								270	into 3
	10:00 AM											80	stop
-	03:45 PM			077.001								80	start
	06:35 PM		0.00	277.981								210	into 4
-	08:30 AM		0.98	278.806								240	into 5
	10:25 PM			279.631	20042.2		00.0	00.0	00.7	00.0	07.0	270	into 3
	11:10 AM			2/9.3/5	30942.2	emerged	98.8	98.8	98.7	98.3	97.9	352	3
06/06	09:50 PM											14	stop
06/08	10:40 AM			005 605								14	start
_	07:45 AM		0.07	287.697								210	into 4
	09:45 PM		0.95	288.501	210515	21.6	00.0	00.0	00.1	00 -	00.0	240	into 5
	11:30 AM				31074.7	3 leaf	99.2	99.2	99.1	98.7	98.3	269	5
	11:50 AM			288.506								270	into 3
06/19	07:35 AM		0.07	296.529								210	into 4
06/19	09:40 PM		0.95	297.337								240	into 5
06/20	11:40 AM			298.141	010 17 0	51 C	00.7	00.0	00.7	00.2	07.0	270	into 3
06/20	04:40 PM			297.059	31247.8	5 leaf	98.7	98.8	98.7	98.2	97.9	280	3
06/25	08:35 PM			202.025	01075	hail	00.0	00.0	00.0	00.5	00.7	186	stop
06/27	11:00 AM	1.41		303.907	31372.4	6 leaf	98.9	99.0	98.9	98.5	98.3	186	start
06/28	07:15 PM			00410								186	start
06/29	05:10 AM			306.121								210	into 4
06/29	09:15 PM		1.09	307.044								240	into 5
06/30	12:35 PM			307.925				0.7	0.7	0.7	0.7	270	into 3
07/06	11:45 AM	0.80			31559.0	7 leaf	99.4	99.6	99.4	99.0	98.8	196	3
07/06	01:15 PM			315.962								210	into 4
07/07	07:55 AM	ļ	1.23	317.00								240	into 5
07/08	05:15 AM			318.129								270	into 3
07/11	11:40 AM			320.746	31678.8	8 leaf	99.0	99.4	98.5	98.9	98.8	152	3

Table 19: 2017 Field Data, "4 GPM" PMDI Corn, 228 bu./ac, Grall

Date Rahfall Impair Wate Hour Growh Sold Models Test Seel Feel Seel Feel Seel Growh			Rainfall	Irrigation	Water	Hour	Growth		Soi	il Moist	1170		Pivot		Well	Tracking
01712 020.5 FM imode 332.421 imode 100.7	Date	Time		-				1 Foot				5 Feet		Crop Irrigate		
07112 08:20 AM 1.20 325.453 240 mod 300 Piotrac 0718 13:20 AM 329.570 13:86.44 11 98.3 98.9 98.9 98.9 98.9 137 3 276 Curis 07120 02020 PM 1.00 33.276 8.8 98.9 98.9 120 imo 272 Piotrac 07120 0120 PM 33.376 8.9 98.9 98.0 124 281 Piotrac 0722 1030 AM 338.308 201.6 inssel 7.0 7.8 98.0 1.24 281 Piotrac Piotrac 280 1.01 31.05 Piotrac 1.01 31.03 275 Piotrac Piotrac 1.01 31.05 Piotrac 1.01 31.05 Piotrac 1.01 31.05 Piotrac 1.01 1.01 1.01 1.01 1.01 1.01 </td <td>07/12</td> <td>02:05 PM</td> <td>(menes)</td> <td>(inches)</td> <td></td> <td>Wieter</td> <td>Buge</td> <td>11000</td> <td>21000</td> <td>5100</td> <td>+100</td> <td>5100</td> <td></td> <td>into 4</td> <td>· · /</td> <td></td>	07/12	02:05 PM	(menes)	(inches)		Wieter	Buge	11000	21000	5100	+100	5100		into 4	· · /	
0711 0615 Add 320,370 138.64 1 Iso 83.8 98.7 98.8 98.0 98.0 210 mino 275 Piotance 0710 180.0 PM 1.0 333.276 188.64 98.7 98.8 98.0 98.0 10.0 10.0 275 Piotance 0712 163.00 PM 1.0 333.276 132.10 14.0 210 mino 5 275 Piotance 0712 163.00 Adl 333.276 tasal 70.9 78.1 76.6 97.8 98.0 124 3 281 Piotance 0727 173.00 Adl 1.44.112 0 1.6 2.70 mino 5 275 Piotance 0727 173.00 Adl 343.033 0 0 0 2.00 mino 5 275 Piotance 0727 173.8 V.58 344.03 1.0 343.03 0 0 2.00 mino 5 275 Piotance 08050 <td></td> <td></td> <td></td> <td>1.20</td> <td></td>				1.20												
07118 1130 AM 3297 59 1384 64 11 kerf 98.3 98.7 98.8 98.8 98.7 98				1.20												
0719 0800 PM 133.276 m m m 10 100 100 275 Pivotrac 0720 102.00 M 1.00 333.296 m m m 20 100 100.5 275 Pivotrac 0721 101.20 AM 333.296 tassel 70.9 78.1 97.6 97.8 98.0 124 3 281 Piul 0722 107.20 AM 343.033 m m 240 100.6 275 Pivotrac 0727 07.35 PM 1.09 343.033 m m 240 100.5 275 Pivotrac 0808 98.40 AM 311.055 m m 210 100.6 275 Pivotrac 0808 143.40 AM 1.18 352.021 mit 67.9 97.2 98.1						31846.4	11 leaf	08.3	98.7	08.8	08.0	08.0				
07:20 02:20 PM 1.10 343.200 model 240 mino 3 275 Pivorma 07:21 10:40 AM 338.308 0 0 77.6 97.8 98.0 124 3 281 Pivali 07:27 10:30 AM 342.112 0 0 210 into 4 275 Pivoras 07:27 0:25 PM 1.00 343.03 0 0 210 into 5 275 Pivoras 07:28 0:45 PM 341.03 0 0 0 270 into 3 275 Pivoras 0800 0:45 PM 2.58 349.256 322.09 bistor 98.0 97.2 98.1 98.1 98.0 105 satt Pivoras 0800 0.55 AM 1.5 341.0 1.0 35.244 232.7.9 mill 98.6 98.1 98.1 98.1 98.1 98.1 98.1 98.1 98.1 98.1 98.1 224 80.7 Pivoras	_					510-0	11 Kul	70.5	70.7	70.0	70.7	70.7				
0721 01:30 PM 335.398 3021.6 ress 70.9 78.1 97.6 97.8 97.0 17.2 01.30 AM 338.206 3201.2.6 ress 70.9 78.1 97.6 97.8 98.0 124 3 3 27.5 Photne 07.27 01.30 AM 1.09 344.033 - - - 21.0 into 4 27.5 Photne 07.27 01.37 S PM 1.09 344.033 - - - 21.0 into 4 27.5 Photne 0800 68.40 AM 351.035 - - - 21.0 into 4 27.5 Photne 0800 14.15 AM 1.18 352.020 - - - - 21.6 4 27.5 Photne 0800 10.43 AM 1.18 353.144 - - - - 1.0 1.0 57.5 Photne 0800 10.43 AM 353.144 - - - - 1.0 1.0 1.0 1.0 7.0 7.1 Photne 0801 10.42 SM - - - - 1.0 1.0 1.0 1.0 1.0 1.0 1.0 <td></td> <td></td> <td></td> <td>1.10</td> <td></td>				1.10												
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0722 0723 0730 0730 <th< td=""><td></td><td></td><td></td><td></td><td></td><td>52012.0</td><td>103501</td><td>70.7</td><td>70.1</td><td>77.0</td><td>77.0</td><td>70.0</td><td></td><td></td><td></td><td></td></th<>						52012.0	103501	70.7	70.1	77.0	77.0	70.0				
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08/17 11:05 PM 11:00 360.523 Image: Second S			1.77		550.701	52117.2	TITIL	70.5	70.5	20.1	70.5	70.1				
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10/24 03:50 PM 398.178 33204.8 black layer 98.2 98.2 97.9 97.8 347 off Curtis 10/30 03:50 PM 398.178 33204.8 black layer 97.5 97.6 97.4 97.2 347 off Curtis 11/07 01:05 PM 398.178 33206.6 black layer 97.6 97.5 97.5 97.2 347 off Curtis 11/07 01:05 PM 398.178 33206.6 black layer 97.6 97.5 97.5 97.0 347 off Curtis 11/07 01:05 PM 398.178 33206.6 black layer 97.6 97.5 97.5 97.0 347 off Curtis 11/07 01:00 PM 398.178 33206.6 harvest 98.0 97.9 98.0 97.7 97.5 10 off Curtis 11/14 01:00 PM 398.178 33206.6 harvest 98.0 97.9 98.0 97.7 97.5 10 off Curtis Total 11.08 17.8			2.1.2													
10/30 03:50 PM 398.178 33204.8 black layer 97.5 97.6 97.4 97.2 347 off Curtis 11/07 01:05 PM 398.178 33206.6 black layer 97.6 97.5 97.5 97.2 97.0 347 off Curtis 11/07 01:05 PM 398.178 33206.6 black layer 97.6 97.5 97.2 97.0 347 off Curtis 11/07 harvest move dry Harold 11/14 01:00 PM 398.178 33206.6 harvested 98.0 97.7 97.5 10 off Curtis Total 11.08 17.84 0.0 0.0 0.0 0.0 a.0 a.0 soil Moisture 283 GPM Leon Net soil moisture is 0.00 inches. uset (0.00 in) is total water (28.92 in). soil Moisture							,									
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Total 11.08 17.84 0.0 0.0 0.0 0.0 0.0 = 0.0 Soil Moisture 283 GPM Leon Net soil moisture is 0.00 inches. Rainfall (11.08 in), irrigation (17.84 in), and net soil moisture (0.00 in) is total water (28.92 in). 0.0 0.0 0.0 0.0 = 0.0 Soil Moisture 283 GPM Leon		01:00 PM			398,178	33206.6		98.0	97.9	98.0	97.7			off		
Net soil moisture is 0.00 inches. Rainfall (11.08 in), irrigation (17.84 in), and net soil moisture (0.00 in) is total water (28.92 in).		21.001.01	11.08	17.84	270.170	22200.0	-141 . 05004								283 GPM	
Rainfall (11.08 in), irrigation (17.84 in), and net soil moisture (0.00 in) is total water (28.92 in).		moisture is						0.0	0.0	0.0	0.0	0.0	0.0	_ on moisture	200 01 10	2001
					and net s	oil moistu	re (0.00 in)	s total	water C	28.92 ir	ı).					
יזעוווטרוא וויז דע מדל ווטר לטעווגלע ווי נוול נטרמו זמווומוו.	·	. ,.	0	, ,,			(1.					

Table 19: 2017 Field Data, "4 GPM" PMDI Corn, 228 bu./ac. Grall (continued)

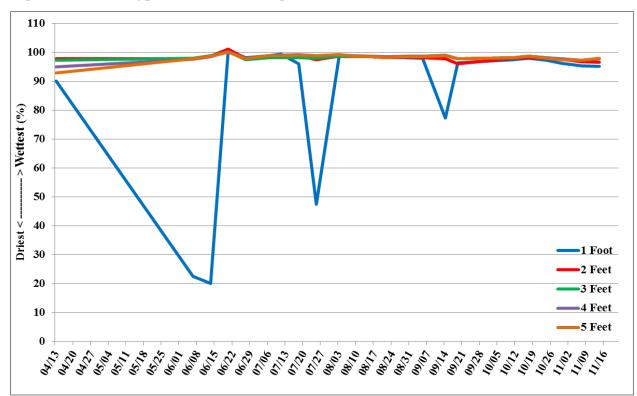
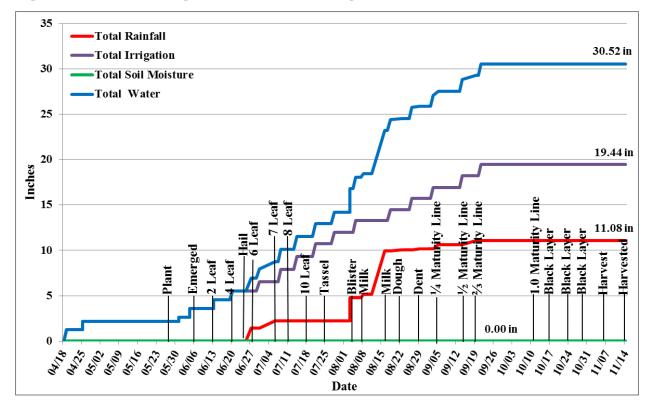


Figure 26: 2017 Gypsum Block Readings, "5 GPM" PMDI Corn, 227 bu/ac, Grall

Figure 27: 2017 Growing Season Water Tracking, "5 GPM" PMDI Corn, 227 bu/ac, Grall



		Rainfall	Irrigation	Water	Hour	Growth		So	il Moist	ure		Pivot	a	Well	Tracking
Date	Time	(inches)	(inches)	Meter	Meter	Stage	1 Foot				5 Feet	Position	Crop Irrigate	(GPM)	
03/30		1.44													Pivotrac
04/01		2.23													Pivotrac
04/05		0.48													Pivotrac
04/13	03:30 PM			256.844	30477.2		90.1	97.7	97.3	95.0	92.8	184		off	C & L
04/17	11:15 AM			256.844								184	start		Pivotrac
04/17	08:05 PM			257.542								210	into 4	320	Pivotrac
04/18	01:40 PM			258.587								240	into 5	320	Pivotrac
04/19	07:15 AM		1.23	259.629								270	into 3	320	Pivotrac
04/21		0.90													Pivotrac
04/24	03:30 PM			267.230								210	into 4	320	Pivotrac
04/25	06:05 AM			268.095								240	into 5	320	Pivotrac
04/25	07:35 PM		0.95	268.895								270	into 3	320	Pivotrac
04/26	07:50 AM			270.137								296	stop	320	Pivotrac
04/26		0.44										296	move dry		Pivotrac
04/30		1.39													Pivotrac
05/03		0.34													Pivotrac
05/10		0.47													Pivotrac
05/16		0.19													Pivotrac
05/18	03:05 PM											350	move dry		Pivotrac
05/22		0.73													Pivotrac
05/27						plant						356	move dry		Harold
05/29	12:30 PM											355	start		Pivotrac
05/31	09:05 AM			272.780								210	into 4	320	Pivotrac
05/31	03:30 PM			273.160								240	into 5	320	Pivotrac
05/31	09:45 PM		0.44	273.531								270	into 3	320	Pivotrac
06/02	10:00 AM											80	stop		Pivotrac
06/02	03:45 PM											80	start		Pivotrac
06/03	06:35 PM			277.981								210	into 4	320	Pivotrac
06/04	08:30 AM			278.806								240	into 5	320	Pivotrac
06/04	10:25 PM		0.98	279.631								270	into 3	320	Pivotrac
06/06	11:10 AM			279.375	30942.2	emerged	22.5	97.7	98.0	97.6	97.8	352	3	320	Curtis
06/06	09:50 PM											14	stop		Pivotrac
06/08	10:40 AM											14	start		Pivotrac
06/12	07:45 AM			287.697								210	into 4	310	Pivotrac
06/12	09:45 PM			288.501								240	into 5	310	Pivotrac
	11:30 AM				31074.7	2 leaf	20.1	98.6	98.8	98.5	98.7	269	5	312	Curtis
06/13	11:50 AM		0.95	288.506								270	into 3	310	Pivotrac
06/19	07:35 AM			296.529								210	into 4	310	Pivotrac
06/19	09:40 PM			297.337								240	into 5	310	Pivotrac
06/20	11:40 AM		0.95	298.141								270	into 3	310	Pivotrac
06/20	04:40 PM			297.059	31247.8	4 leaf	100.6	101.1	100.3	100.3	100.1	280	3	310	Curtis
06/25	08:35 PM					hail						186	stop		Pivotrac
06/27	11:00 AM	1.41		303.907	31372.4	6 leaf	98.2	97.8	97.4	97.7	97.7	186	off		Curtis
06/28	07:15 PM											186	start		Pivotrac
06/29	05:10 AM			306.121								210	into 4	310	Pivotrac
06/29	09:15 PM			307.044								240	into 5	310	Pivotrac
06/30	12:35 PM		1.04	307.925								270	into 3	310	Pivotrac
07/06	11:45 AM	0.80		314.331	31559.0	7 leaf	98.9	98.7	98.1	98.8	98.8	196	3	302	Curtis
07/06	01:15 PM			315.962								210	into 4	300	Pivotrac
07/07	07:55 AM			317.00								240	into 5	300	Pivotrac
07/08	05:15 AM		1.34	318.129								270	into 3	300	Pivotrac
07/11	11:40 AM			320.746	31678.8	8 leaf	99.3	98.8	98.1	99.0	98.8	152	3	292	Curtis

Table 20: 2017 Field Data, "5 GPM" PMDI Corn, 227 bu/ac, Grall

		Rainfall	Irrigation	Water	Hour	Growth		So	il Moist	ure		Pivot		Well	Tracking
Date	Time	(inches)	(inches)	Meter	Meter	Stage	1 Foot		3 Feet		5 Feet	Position	Crop Irrigate	(GPM)	Source
07/12	02:05 PM	, ,		324.231		U						210	into 4	300	Pivotrac
07/13	08:20 AM			325.245								240	into 5	300	Pivotrac
07/14	06:15 AM		1.44	326.463								270	into 3	300	Pivotrac
07/18	11:30 AM			329.579	31846.4	10 leaf	96.0	98.9	98.2	99.1	99.0	137	3	276	Curtis
07/19	08:00 PM			333.276								210	into 4	275	Pivotrac
07/20	02:20 PM			334.209								240	into 5	275	Pivotrac
07/21	01:40 PM		1.41	335.398								270	into 3	275	Pivotrac
07/25	10:20 AM			338.206	32012.6	tassle	47.4	97.4	98.0	98.8	98.8	124	3	281	Paul
07/27	01:30 AM			342.112								210	into 4	275	Pivotrac
07/27	07:35 PM			343.033								240	into 5	275	Pivotrac
07/28	04:35 PM		1.27	344.103								270	into 3	275	Pivotrac
08/03	08:40 AM			351.035								210	into 4	275	Pivotrac
08/03	12:35 PM	2.58		349.356	32230.9	blister	98.7	98.6	98.7	99.2	99.1	216	4	276	Curtis
08/04	04:15 AM			352.032								240	into 5	275	Pivotrac
08/05	01:40 AM		1.28	353.114								270	into 3	275	Pivotrac
	04:25 AM											15	stop		Pivotrac
08/07	10:55 AM											15	start		Pivotrac
08/08	03:55 PM	0.36		355.294	32347.9	milk	98.5	98.4	98.4	98.8	98.7	80	3	264	Curtis
08/11	04:10 AM	0.20		359.597	0201117		70.0	2011	2011	2010	2017	210	into 4	250	Pivotrac
08/11	01:25 PM			337.371								210	stop	230	Pivotrac
08/16	04:45 PM	4.77		358.764	32417.2	milk	98.5	98.4	98.5	98.7	98.5	224	off		Curtis
08/10	12:20 PM	4.77		556.704	52417.2	IIIIK	70.5	70.4	70.5	70.7	70.5	224	start		Pivotrac
08/17	12:20 PM			360.523								240	into 5	250	Pivotrac
08/17	08:50 PM		1.19	361.530								240	into 3	250	Pivotrac
08/18	04:35 PM	0.11	1.19	365.215	32541.4	dough	98.2	98.2	98.3	98.4	98.2	110	3	265	Curtis
08/22	04.33 I M 05:00 AM	0.11		303.213	52541.4	uougii	90.2	90.2	90.5	90.4	90.2	134		203	Pivotrac
08/23	10:55 AM											134	stop		Pivotrac
				269 622									start	250	
08/25	12:10 AM			368.633								210	into 4	250	Pivotrac
08/25	06:00 PM		1.00	369.552								240	into 5	250	Pivotrac
08/26	04:55 PM	0.12	1.26	370.613	22,000.4	1 /	00.1	00.2	00.5	00.6	00.4	270	into 3	250	Pivotrac
08/29	12:40 PM	0.12		373.201	32699.4	dent	98.1	98.3	98.5	98.6	98.4	58	3	268	Curtis
08/29	10.05 11.6			148								210		250	D: .
09/01	10:25 AM			376.980								210	into 4	250	Pivotrac
09/02	05:25 AM			377.860								240	into 5	250	Pivotrac
	03:05 AM		1.19	378.863								270	into 3	250	Pivotrac
09/05	03:40 PM	0.46		381.657	32870.5	1/4 mat line	97.9	98.2	98.5	98.6	98.4	42	3	266	Curtis
09/08	10:00 AM				32870.5							185	3		Pivotrac
09/11	04:10 PM											185	start		Pivotrac
09/12	05:05 AM			385.597								210	into 4	260	Pivotrac
09/12	10:25 PM			386.431								240	into 5	260	Pivotrac
09/13	08:50 PM			387.511								270	into 3	260	Pivotrac
	03:20 PM		1.28			1/2 mat line	77.3	97.8	98.9	99.0	98.8	311	3	272	Curtis
	09:55 AM	0.47			33122.4	⅔ mat line	96.4	96.0	97.7	97.8	97.7	197	3	256	Curtis
09/19	04:00 PM			394.470								210	into 4	270	Pivotrac
09/20	11:30 AM			395.445								240	into 5	270	Pivotrac
09/21	08:30 AM		1.24	396.496								270	into 3	270	Pivotrac
09/22	08:30 PM			398.296								347	stop	270	Pivotrac
10/11	03:25 PM	5.72		398.178	33204.8	1.0 mat line	97.4	98.0	98.2	98.2	98.1	347	off		Curtis
10/17	03:45 PM			398.178	33204.8	black layer	98.0	98.1	98.7	98.7	98.6	347	off		Curtis
10/24	03:50 PM			398.178	33204.8	black layer	97.2	97.9	98.1	98.2	98.0	347		off	Curtis
10/30	03:50 PM					black layer	96.2	97.6	97.6	97.7	97.5	347		off	Curtis
11/07	01:05 PM					black layer	95.4	96.7	97.2	97.3	97.2	347		off	Curtis
11/07						harvest						move dry			Harold
11/14	01:00 PM			398.178	33204.8	harvested	95.2	96.5	97.8	97.8	97.9	10		off	Curtis
Total		11.08	19.44				0.0	0.0	0.0	0.0	0.0	= 0.0	Soil Moisture		Leon
-	noisture is (
				and net so	il moisture	e (0.00 in) is	total w	ater (3	0.52 in)						
*Number	ra in rad ara	not cour	tod in the t	total rainfa	11	() 15		(5)							

Table 20: 2017 Field Data, "5 GPM" PMDI Corn, 227 bu/ac, Grall (continued)

2017 Harvest Results "3-4-5 GPM" LEPA Shroud Corn, Grall

The 3 GPM LEPA field produced a 236 bushel per acre corn yield. Irrigation totaled 13.08 inches that included 1.13 inches of pre-water. Production in the 4 GPM field was 240 bushels per acre. Irrigation totaled 17.84 inches with 2.25 inches of pre-water. Corn yield was 237 bushels per acre for the 5 GPM field. Irrigation totaled 19.44 inches that included 2.18 inches of pre-water.

The 4 GPM field produced 4 more bushels per acre than the 3 GPM field and irrigation was 4.76 inches more. The 5 GPM field produced 1 more bushel per acre than the 3 GPM with 6.36 more inches of irrigation. The 4 GPM yield was 3 more bushels per acre than that from the 5 GPM field with 1.60 less inches of irrigation.

Corn production was 18.04 bushels (1,010 lb.) per inch of irrigation in the 3 GPM field compared to 13.45 bushels (753 lb.) in the 4 GPM field and 12.19 bushels (682 lb.) from the 5 GPM field. Production from each inch of irrigation, rainfall, and net soil water that totaled 24.16 inches was 9.77 bushels (547 lb.) per acre in the 3 GPM field. Irrigation, rainfall, and net soil water totaled 28.92 inches in the 4 GPM field where production was 8.30 bushels (464 lb.) per inch. In the 5 GPM field, irrigation, rainfall, and net soil water totaled 30.52 inches where production was 7.76 bushels (435 lb.) per inch of total water.

Crop production costs were \$33.38 per acre more for the 4 GPM field than for the 3 GPM from increased fertilizer, irrigation, and harvest expenses. At \$3.63 per bushel, the 4 bushels per acre increased corn yield in the 4 GPM field amounted to \$14.52 more per acre than from the 3 GPM field. The 3 GPM field's net gain was \$18.86 per acre with 4.76 inches less irrigation used compared to production from the 4 GPM field. Value of the additional 1 bushel produced in the 5 GPM field compared to the 3 GPM was \$3.63 per acre. Production costs were \$40.41 more for the 5 GPM field. Net gain for the 3 GPM field was \$36.78 per acre more than from the 5 GPM with 6.36 inches less irrigation. At \$3.63 per bushel, the 3 bushel per acre increased yield from the 4 GPM field compared to the 5 GPM amounts to \$10.89. Crop production costs were \$7.03 more for the 5 GPM field from increased irrigation costs. The 4 GPM field's net gain compared to the 5 GPM field was \$17.92 per acre with 1.60 less inches of irrigation.

Net return from the 3 GPM field was \$454.70 per acre compared to \$435.85 from the 4 GPM field and \$417.93 from the 5 GPM field. Net return from each inch of irrigation was \$34.76 for the 3 GPM field compared to \$24.43 from the 4 GPM, and \$21.50 for the 5 GPM field. Net return from each inch of irrigation, rainfall, and net soil water was \$18.82 per acre for the 3 GPM field, \$15.07 from the 4 GPM, and \$13.69 for the 5 GPM field. A summary of the demonstration results are shown in Table 21 and Appendix B.

2017 Harvest Results "3-4-5 GPM" T-L PMDI Corn, Grall

The 3 GPM T-L PMDI field produced a 221 bushel per acre corn yield. Irrigation totaled 13.08 inches that included 1.13 inches of pre-water. Production in the 4 GPM field was 228 bushels per acre. Irrigation was 17.84 inches that included 2.25 inches of pre-water. Corn yield was 227 bushels per acre for the 5 GPM field. Irrigation totaled 19.44 inches that included 2.18 inches of pre-water.

The 4 GPM field produced 7 more bushels per acre than the 3 GPM field and irrigation was 4.76 inches more. The 5 GPM field produced 6 more bushels per acre than the 3 GPM with 6.36 more inches of irrigation. The 4 GPM yield was 1 more bushel per acre than that from the 5 GPM field with 1.60 less inches of irrigation.

Corn production was 16.89 bushels (946 lb.) per inch of irrigation in the 3 GPM field compared to 12.78 bushels (715 lb.) in the 4 GPM and 11.67 bushels (654 lb.) from the 5 GPM field. Production from each inch of irrigation, rainfall, and net soil water that totaled 24.16 inches was 9.15 bushels (512 lb.) per acre in the 3 GPM field. Irrigation, rainfall, and net soil water totaled 28.92 inches in the 4 GPM field where production was 7.88 bushels (441 lb.) per inch. In the 5 GPM field, irrigation, rainfall, and net soil water totaled 30.52 inches where production was 7.43 bushels (416 lb.) per inch of total water.

Crop production costs were \$36.28 per acre less for the 3 GPM field than for the 4 GPM field from reduced irrigation, fertilizer, and harvest expenses. At \$3.63 per bushel, the 7 bushels per acre increased corn yield in the 4 GPM field amounted to \$25.41 more per acre than from the 3 GPM field. The 3 GPM field's net gain was \$10.87 per acre with 4.76 inches less irrigation compared to production from the 4 GPM field. Value of the additional 6 bushels produced in the 5 GPM field compared to the 3 GPM was \$21.78 per acre. Production costs were \$45.23 more for the 5 GPM field. Net gain for the 3 GPM field was \$23.45 per acre more than from the 3 GPM with 6.36 inches less irrigation. At \$3.63 per bushel, the 1 bushel per acre increased yield from the 4 GPM field compared to the 5 GPM amounted to \$3.63. Crop production costs were \$8.95 more for the 5 GPM field from increased irrigation costs. The 4 GPM field's net gain compared to the 5 GPM field was \$12.58 per acre with 1.60 less inches of irrigation.

Net return from the 3 GPM field was \$414.73 per acre compared to \$403.86 from the 4 GPM field and \$391.28 from the 5 GPM field. Net return from each inch of irrigation is \$31.71 for the 3 GPM field compared to \$22.64 from the 4 GPM and \$20.13 for the 5 GPM field. Net return from each inch of irrigation, rainfall, and net soil water was \$17.16 for the 3 GPM field, \$13.96 from the 4 GPM, and \$12.82 for the 5 GPM field. A summary of the demonstration results are shown in Table 21 and Appendix B.

	.	T 1	Prod	uction	Gross	Crop Value @	@ \$3.63/bu
GPM	Irrigation (in)	Total Water (in)	bu/ac	lb/ac-in of Irrigation	per acre (\$)	Acre-inch of Irrigation (\$)	Acre-inch of Total Water (\$)
3 GPM LEPA	13.08	24.16	236	1010	\$856.68	\$65.49	\$35.46
4 GPM LEPA	17.84	28.92	240	753	\$871.20	\$48.83	\$30.12
5 GPM LEPA	19.44	30.52	237	682	\$860.31	\$44.25	\$28.19
All fields include	e 0.00 inch	es of soil wa	ater within	5 feet of sc	oil, only rainfa	all and irrigation	n.

Table 21: 2017 LEPA Shroud Demonstration Results, Grall

	т ·	T 4 1 XV 4	Proc	luction	Gross	s Crop Value	@ \$3.63/bu
GPM	(in)	Total Water (in)	bu/ac	lb/ac-in of	per acre	Acre-inch of	Acre-in of
	(11)	(Ш)	0u/ac	Irrigation	(\$)	Irrigation (\$)	Total Water (\$)
3 GPM PMDI	13.08	24.16	221	946	\$802.23	\$61.33	\$33.20
4 GPM PMDI	17.84	28.92	228	715	\$827.64	\$46.39	\$28.62
5 GPM PMDI	19.44	30.52	227	654	\$824.01	\$42.38	\$27.00
All fields include	le 0.00 inc	hes of soil wa	ter within	5 feet of soil,	only rainfa	all and irrigatio	on.

Table 22: 2017 T-L PMDI Demonstration Results, Grall

2017 Harvest Results LEPA Shroud and T-L PMDI Corn, Grall

The 3 GPM LEPA Shroud field produced a 236 bushel per acre corn yield. Seasonal irrigation totaled 13.08 inches that included 1.13 inches of pre-water. Production in the 3 GPM T-L PMDI field was 221 bushels per acre. The 3 GPM LEPA field produced 15 more bushels per acre than the T-L PMDI field with the same 13.08 inches of irrigation. Corn production was 18.04 bushels (1,010 lb.) per inch of irrigation in the 3 GPM LEPA Shroud field and 16.89 bushels (946 lb.) in the 3 T-L PMDI field.

Yield was 240 bushels per acre in the 4 GPM LEPA field with 17.84 inches of irrigation that included 2.25 inches of pre-water. Production in the 4 GPM T-L PMDI field was 228 bushels per acre with the same 17.84 inches of irrigation. Production was 13.45 bushels (753 lb.) from each inch of irrigation for the 4 GPM LEPA field and 12.78 (715 lb.) for the 4 T-L PMDI field.

Yield was 237 bushels per acre in the 5 GPM LEPA field with 19.44 inches of irrigation and 227 bushels in the T-L PMDI. Production was 12.19 bushels (682 lb.) from each inch of irrigation for the 5 GPM LEPA and 11.67 bushels (654 lb.) for the 5 GPM T-L PMDI.

Production from each inch of irrigation, rainfall, and net soil water that totaled 24.16 inches was 9.77 bushels (547 lb.) per acre for the 3 GPM LEPA Shroud field. Irrigation, rainfall, and net soil water totaled 24.16 inches for the 3 GPM T-L PMDI field from which production was 9.15 bushels (512 lb.) per inch.

Production from each inch of total water that was 28.92 inches in the 4 GPM fields was 8.30 bushels (465lbs) per acre in the 4 GPM LEPA Shroud field and 7.88 bushels (442lbs) per acre in the 4 GPM T-L PMDI field.

Irrigation, rainfall, and net soil water was 30.52 inches for the 5 GPM LEPA field. Production was 7.76 bushels (435 lb.) from each inch of total water. Total water was 30.52 inches for the 5 GPM T-L PMDI from which production was 7.43 bushels (416 lb.) per inch.

Crop production costs for irrigation, seed, fertilizer, and harvest costs were \$401.97 per acre for the 3 GPM LEPA Shroud and \$387.50 for the 3 GPM T-L PMDI fields. At \$3.63 per bushel, value of the 15 bushel per acre additional yield for the LEPA Shroud was \$54.45 per acre. Net return from the 3 GPM

LEPA field was \$39.98 per acre more than that from 3 GPM PMDI. Net return from each inch of irrigation is \$31.71 for the T-L PMDI field and \$34.76 for 3 GPM LEPA.

Production costs totaled \$435.45 for the 4 GPM LEPA and \$423.78 for T-L PMDI. Value of the 12 additional bushels per acre at \$3.63 per bushel was \$43.56. Net return was \$31.49 per acre more for 4 GPM LEPA. Net return from each inch of irrigation was \$22.64 for the T-L PMDI and \$24.43 for 4 GPM LEPA.

Production costs were \$442.38 for the 5 GPM LEPA field and \$432.73 for the T-L PMD I field. At \$3.63 per bushel, value of the 10 additional bushels produced in the 5 GPM LEPA field was \$36.30 per acre. Additional net return for the 5 GPM LEPA field was \$26.65 per acre. Net return from each inch of irrigation was \$20.13 for 5 GPM T-L PMDI field and \$21.50 for the LEPA Shroud field.

Net return from each inch of irrigation, rainfall, and net soil water that totaled 24.16 inches was \$18.82 per inch for the 3 GPM LEPA Shroud field and \$17.16 per inch for the T-L PMDI field. Irrigation, rainfall, and net soil water totaled 28.92 inches in the 4 GPM LEPA field from which net return was \$15.07. Total water was 28.92 inches in the 4 GPM T-L PMDI with a net return of \$13.96 from each inch. For the 5 GPM LEPA field, irrigation, rainfall, and net soil water totaled 30.52 inches from which net return was \$13.69 per inch. Total water was 30.52 inches in T-L PMDI field from which net return was \$12.82 per inch.

The 2017 LEPA Shroud and T-L PMDI demonstration are an excellent comparison of two high efficiency water application center pivot irrigation systems. Both LEPA Shroud and T-L PMDI center pivot systems, when properly equipped and managed, can extend the profitability of irrigated crop production in combination with advanced management tools and technology utilized and demonstrated by the "3-4-5 GPM" project. 2017 was the final year of the "3-4-5 GPM" demonstration project; however, the District continues to provide information for potential ready grower adoption. A summary of the 2017 LEPA Shroud and T-L PMDI demonstration results are shown in Table 21 and Table 22 above and in Appendix B.

Danny Krienke's 2017 Ochiltree County Corn Demonstration

2017 Planting and Crop Information, LEPA Corn, Krienke

Danny Krienke strip tilled and planted 180 acres of corn in three quarters of a 240 acre circle in Section 47, for his "3-4-5 GPM" demonstration. Danny added an early planted 3 GPM field, "3 GPM-E", to his demonstration. The 180 acres were divided to strategically manage available irrigation water for his 3 GPM-Early, 3 GPM, 4 GPM, and 5 GPM fields. 0 to 90 degrees was his 3 GPM-Early planted field, 180 to 300 degrees was the 3 GPM field, 300 to 330 degrees was his 4 GPM field, and 330 to 0 degrees was the 5 GPM field. From 90 to 180 degrees, there was a fallow field. Krienke planted his 3 GPM-Early field to Golden Acres hybrid GA4173ADG at 32,000 seeds per acre on May 9. His 3-4-5 GPM fields were planted to GA7007DG on May 31. Seeding rates were 28,000 for the 3 GPM, 4 GPM and 5 GPM fields. Center pivot travel speed was by Lindsey Mfg. Field Net. Krienke used 2 irrigation plans to rotate 1.10 inches per week applications between his 3 GPM-Early planted acres and the 3 GPM late planted acres, guided by plant growth stage and soil water sensors. Center pivot travel speed was also programed to apply 1.49 inches on the 4 GPM field and 1.85 inches on the 5 GPM field each week. Irrigation plans were modified during the late growing season to apply reduced irrigation amounts when needed, especially for the 5 GPM acres. Advanced technology soil moisture sensors guided reduced irrigation amounts. Seasonal weekly water meter readings averaged 533 GPM, which is 2.96 GPM per acre irrigation capacity. Irrigation was with Senninger's LEPA shroud UP-3 bubbler attached to drops spaced 30 inches apart. Timely beneficial rainfall contributed to producing the crop in combination with well managed timely irrigation. Planting and crop information for "Krienke 3 GPM-E", Krienke 3 GPM", "Krienke 4 GPM", and "Krienke 5 GPM" are shown in Table 23 below.

3 GPM-Early Der	nonstration Site: 0 - 90 c	degrees	
Planted	May 9	Harvested	October 21
Hybrid	GA4173ADG	Seeding Rate	32,000
Row Width	30 inches	Tillage	Strip Till
No. Acres	60.00	GPM per acre	2.96
Total Water	27.52 inches	Soil Type	Sherman Silty Clay Loam
Irrigation	18.03 inches	Insecticide	None
3 GPM Demonstr	ration Site: 180 - 300 deg	rees	
Planted	May 31	Harvested	November 12
Hybrid	GA7007DG	Seeding Rate	28,000
Row Width	30 inches	Tillage	Strip Till
No. Acres	80.00	GPM per acre	2.96
Total Water	23.58 inches	Soil Type	Sherman Silty Clay Loam
Irrigation	13.10 inches	Insecticide	None

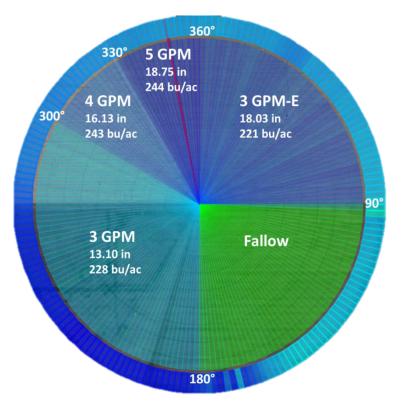
Table 23: 2017 Planting and Crop Information, LEPA Corn, Danny Krienke

4 GPM Demonstr	ation Site: 300 - 330 degrees	S	
Planted	May 31	Harvested	November 12
Hybrid	GA7007DG	Seeding Rate	28,000
Row Width	30 inches	Tillage	Strip Till
No. Acres	20.00	GPM per acre	3.95
Total Water	27.73 inches	Soil Type	Sherman Silty Clay Loam
Irrigation	16.13 inches	Insecticide	None
5 GPM Demonstr	ation Site: 330 - 0 degrees		
Planted	May 31	Harvested	November 12
Hybrid	GA7007DG	Seeding Rate	28,000
Row Width	30 inches	Tillage	Strip Till
No. Acres	20.00	GPM per acre	4.93
Total Water	29.23 inches	Soil Type	Sherman Silty Clay Loam
Irrigation	18.75 inches	Insecticide	None

 Table 23: 2017 Planting and Crop Information, LEPA Corn, Danny Krienke (continued)

2017 Irrigation Intensity Map, LEPA Corn, Krienke

Danny Krienke used 80 acres from 180 to 300 degrees in the circle for his 3 GPM field, 300 to 330 degrees for his 4 GPM, 330 to 360 degrees for his 5 GPM field and 0 to 90 degrees for his 3 GPM-Early planted field. 90 to 180 degrees was fallow. Seasonal water meter readings for the one irrigation well averaged 533 gallons per minute (gpm) making the irrigation capacity 2.96 GPM per acre for 180 acres of corn. Figure 28: 2017 Irrigation Intensity Map, LEPA Corn, Krienke



Water Profile and Growing Season Rainfall, LEPA Corn, Krienke

"3 GPM-Early" Demonstration Site

Rainfall prior to planting provided good beginning soil water levels to 5 feet. Plants developed root systems to use soil water from 2 feet by the second week in July, in addition to irrigation and rainfall. Plant roots grew into the 3rd foot root zone by mid-July depleting available soil water stored at 2 feet and most at 3 feet plus rainfall and irrigation. Basically, no soil water was used from 4 and 5 feet indicating superior plant root development in the upper 3 feet root zone. There was no beneficial rainfall in July and September, but 4.28 inches in August significantly contributed and 2.52 inches in October helped finish the crop. Periodic rainfall totaled 9.49 inches from planting until grain maturity in mid-October. Soil moisture sensors show the plants had adequate water during the growing season. Late season rainfall refilled the soil profile to 5 feet. Soil is Sherm silty clay loam that stores 2.00 inches of available water per foot and no indication of caliche to that depth.

"3 GPM" Demonstration Site

Beginning soil water was good at 1, 2, 3, 4 and 5 feet. Weekly gypsum block readings indicated the crop used soil water stored at 1 and 2 feet in July when there was no beneficial rainfall and depleted water stored at 3 feet in August. None of the 3.98 inches of August rainfall reached the soil moisture sensor positioned at 3 feet. The sensors show no soil water was used from 4 and 5 feet, likely because sufficient water was available from the upper root zone. Sensors show the crop had adequate soil water during the growing season. Rainfall from planting until grain black layer totaled 10.48 inches. Gypsum blocks were installed in early-June following planting. Soil is Sherm silty clay loam that provides 2.00 inches of available water from each foot of the soil profile for potential plant use. No caliche was encountered when installing the gypsum block sensors to 5 feet in the plant root zone.

"4 GPM" Demonstration Site

Early season soil water was good at 1, 2, 3, 4 and 5 feet in the crop root zone. Plants began to require more water than rainfall and irrigation provided in late July and early August, using significant amounts of available soil water from both 1 and 2 feet. Roots developed into 3 feet of the soil profile in late July and continued using available water from that depth during August and September, plus irrigation and rainfall. Soil water sensors show plants did not use water from 4 and 5 feet. Weekly gypsum block readings show good soil moisture levels were maintained at 1, 2, 3, 4 and 5 feet during the growing season from periodic, timely beneficial rainfall and well guided irrigation. The crop used 1.12 inches of soil water mostly from 3 feet in the soil root zone in addition to rainfall and irrigation producing the crop. Soil moisture sensors show the crop had sufficient soil water during the growing season. Rainfall from planting through black layer totaled 10.48 inches. The crop was produced in Sherm silty clay loam soil that holds approximately 2.00 inches available water per foot for potential crop use. There was no indication of caliche to the 5 feet depth in the plant root zone.

"5 GPM" Demonstration Site

Beginning soil water was good at 1, 2, 3, 4 and 5 feet at planting. Soil moisture sensors show plants needed more water than irrigation and rainfall provided in late July and early August, using additional amounts from 1 and 2 feet from the root zone. Additional soil water was used from 3 feet in the root

zone during September when there was no beneficial rainfall. Weekly irrigation amounts were reduced in late September guided by soil moisture sensors. Weekly gypsum block moisture sensors show the crop had sufficient available soil water during the entire growing season. The sensors show the crop root zone was refilled by late season rainfall in October that finished producing the corn yield. Rainfall was 10.48 inches. Irrigation totaled 18.75 inches. The crop was produced in Sherm Silty Clay loam soil that holds 2.00 inches of available water per foot for potential crop use. No caliche soil was encountered installing soil water sensors to 5 feet in the plant root zone.

GPM	May (in)	June (in)	July (in)	August (in)	September (in)	October (in)	Total (in)
3-E	0.85	1.21	0.37	4.28	0.26	2.52	9.49
3	0.00	1.15	0.42	3.98	0.15	4.78	10.48
4	0.00	1.15	0.42	3.98	0.15	4.78	10.48
5	0.00	1.15	0.42	3.98	0.15	4.78	10.48

Table 24: 2017 Monthly Rainfall Data, LEPA Corn, Krienke

2017 Growing Season Water Tracking, LEPA Corn, Krienke

The district tracked total water and crop growth throughout the growing season using rain gauges, water meters and both gypsum blocks and AquaSpy® soil moisture sensors. One set of five gypsum block soil moisture sensors was installed at 1, 2, 3, 4 and 5 feet and an AquaSpy[™] soil moisture probe was installed down to 4 feet in the root zone at one location to monitor soil water levels in the "3 GPM" field. Another set of the same type of sensors were installed in each "3 GPM-Early", "4 GPM" and "5 GPM" fields. Both the gypsum block sensors and the soil probe were installed in close proximity to each other in each field. Gypsum blocks, water meters, rain gauges and crop growth were read, recorded and utilized weekly by district personnel. A 24/7 Aquaspy probe website showed soil moisture at 4 inch increments to 48 inches and monitored plant root growth. The website lists all Aquaspy soil probes in the 3, 4, 5, GPM project and is available to all cooperators and district personnel. Another 24/7 Pivotrac website tracks each center pivot, monitors system position and travel and provides information to make irrigation management strategies. Both the cooperating grower and district "3-4-5 GPM" Project Leader collectively monitored, controlled and managed irrigation from the Pivotrac website.

Following this paragraph, a series of graphs and tables show weekly gypsum block readings for the season; growing season water, including rainfall, irrigation, and soil moisture at various growth stages; and the order of irrigation and rainfall events for each "3-Early, 3, 4, 5, GPM" field. Finally, a form describes the protocols for each field. "Total Water," as shown on the graph for growing season water, is the sum of seasonal irrigation, rainfall and net soil water. Graphs and tables for the 3 GPM-Early acres are shown first, followed by the same illustrations for each 3 GPM, 4 GPM and 5 GPM field.

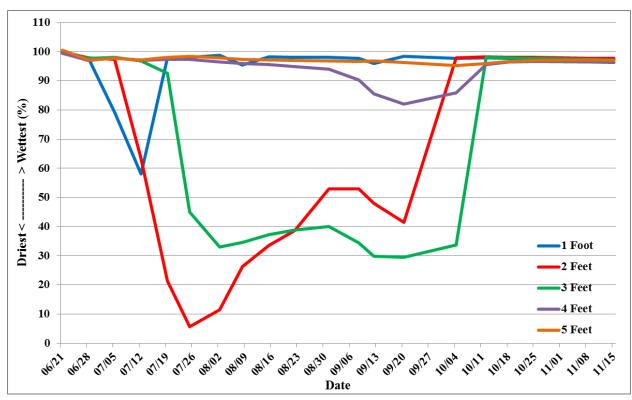
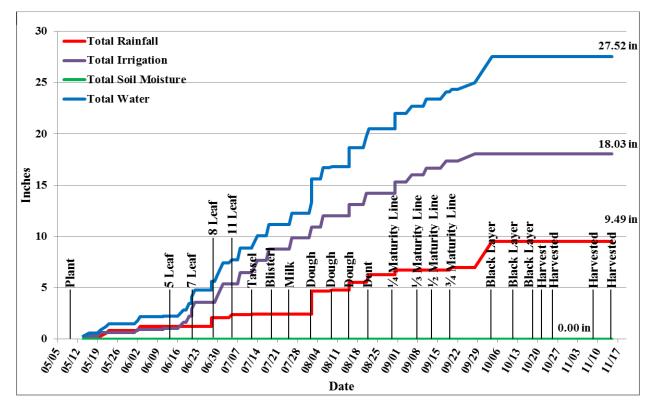


Figure 29: 2017 Gypsum Block Readings, "3 GPM-Early" LEPA Corn, 221 bu/ac, Krienke

Figure 30: 2017 Growing Season Water Tracking, "3 GPM-Early" LEPA Corn, 221 bu/ac, Krienke



D .		Rainfall	Irrigation	Water	Growth		So	il Moist	ure		Pivot	Crop	Well	Pivot	Tracking
Date	Time	(inches)	(inches)	Meter	Stage	1 Foot	2 Feet	3 Feet	4 Feet	5 Feet	Position	Irrigated	(GPM)	Rotation	Source
04/21		0.91		980.86							234				Pivotrac
04/30		1.19													Pivotrac
05/03		0.78		980.86	mlont						234			atom	Pivotrac Danny
	07:15 AM			980.80	plant						234			stop stop	Pivotrac
05/10	10:00 AM			980.86							3-E			move dry	Pivotrac
05/13	12:30 PM			980.86							90	start		ccw	Pivotrac
05/14	02:20 AM		0.29	982.30							0	3-E	565	stop	Pivotrac
05/16		0.27									0			stop	Pivotrac
05/19	03:05 PM										0	start		cw	Pivotrac
05/20	06:10 PM	0.22	0.33	983.84							90	3-E	600	stop	Pivotrac
05/22 05/23		0.32													Pivotrac Pivotrac
06/01	03:10 PM	0.20									90	start		ccw	Pivotrac
	06:15 AM		0.31	985.56							0	3-E	565	into 5	Pivotrac
06/02	11:15 AM			986.08							330	5	565	into 4	Pivotrac
06/02	04:20 PM			986.61							300	4	565	into 3	Pivotrac
06/03	12:35 PM	0.37		988.73							180	3	565	stop	Pivotrac
06/04	07.00 DM										190	2		stop	Pivotrac
06/05 06/06	07:00 PM 12:45 PM			990.59							180 300	3	565	start cw into 4	Pivotrac Pivotrac
06/06	10:55 PM			991.65							1	4&5	565	into 3-E	stop
06/07	08:45 AM										1	3-E	565	start	Pivotrac
06/07	10:35 AM			991.74							12	3-E	554	ccw	Curtis
06/07	12:40 PM		0.08	992.07							360	3-E	565	into 5	Pivotrac
06/07	05:10 PM			992.54							330	5		into 4	Pivotrac
06/07	09:40 PM			993.02							300	4	565	into 3	Pivotrac Pivotrac
06/08	04:10 PM 02:50 PM			994.95							180 90	3	565	stop move dry	Pivotrac
06/10	03:10 PM										90	3-E		start ccw	Pivotrac
06/11	08:50 PM		0.61	998.03							0	3-E	560	stop	Pivotrac
06/12	05:30 PM										0	3-E	560	start cw	Pivotrac
06/13	11:30 PM		0.62	1001.14							90	3-E	560	stop	Pivotrac
06/14	10:05 AM			1000.78	5 leaf						90		off		Curtis
06/15	10:15 AM		0.55	1004.42							90	3-E	5.60	start ccw	Pivotrac
06/16 06/18	06:00 PM 01:45 AM		0.66	1004.43 1007.72							0 90	3-E 3-E	560 560	reverse move dry	Pivotrac Pivotrac
06/18	06:55 PM		0.00	1007.72							180	3	500	start cw	Pivotrac
06/20	11:35 AM			1011.87							300	into 4	550		Pivotrac
06/20	09:20 PM			1012.86							330	into 5	550		Pivotrac
06/21	07:55 AM			1013.93							360	into 3-E	550		Pivotrac
06/21	02:35 PM			1013.63	7 leaf	99.9	99.5	99.4	99.5	100.5	20	3-E	525		Curtis
06/21	08:50 PM										38	3-E		stop	Pivotrac
06/22 06/22	04:30 PM 07:45 PM										38 48	3-E		start cw stop	Pivotrac Pivotrac
06/22	08:10 PM										48	3-E		start cw	Pivotrac
06/22	10:30 PM										55	3-E		stop	Pivotrac
06/23	09:10 AM										55	3-E		start cw	Pivotrac
06/23	09:10 AM		0.62	1017.04							90	3-E	550	reverse	Pivotrac
06/26	06:45 AM		1.17	1022.91							0	into 5	550	ccw	Pivotrac
06/27	02:20 AM			1024.90 1026.47							330	into 4	550	ccw	Pivotrac
06/27 06/28	05:45 PM 11:00 AM	0.84		1026.47	8 leaf	97.8	97.8	97.7	97.0	97.2	300 257	into 3 3	550 546	ccw	Pivotrac Curtis
	05:35 PM	5.04		1020.37	o ioui	27.0	21.0	21.1	27.0		180	3	550	1	Pivotrac
06/29	10:35 PM			1031.85							90	into 3-E	550	ccw	Pivotrac
07/02	05:35 AM		1.12	1037.46							0	into 5	550	ccw	Pivotrac
07/03	12:40 AM			1039.40							330	into 4	550	ccw	Pivotrac
	04:15 PM	0.21		1040.99	11.1 6	70.2	07.2	00.0	07.0	07.5	300	into 3	550	ccw	Pivotrac
07/05 07/05	11:40 AM 03:30 PM	0.31		1043.37 1045.80	11 leaf	79.2	97.3	98.0	97.8	97.6	189 180	3 move dry	550	0.000	Curtis
07/05	11:40 PM			1045.80							90	move dry start	550	ccw ccw	Pivotrac Pivotrac
	09:10 AM		1.17	1051.65							0	into 5	550	ccw	Pivotrac
	04:00 AM			1053.57							330	into 4	550	ccw	Pivotrac
07/09	07:25 PM			1055.14							300	into 3	550	ccw	Pivotrac
07/11	06:10 PM			1059.90							180	move dry	550	ccw	Pivotrac
07/11	11:15 PM	0.05		1050 77	. 1	50.0	62.4	06.0	07.0	07.0	90	start	5.4.5	ccw	Pivotrac
	09:30 AM 06:40 AM	0.06	1.11	1058.77 1065.45	tassel	58.0	63.4	96.8	97.0	97.2	75 0	3-E into 5	546 540	ccw	Curtis Pivotrac
	06:40 AM 01:30 AM		1.11	1065.45							330	into 5 into 4	540	ccw ccw	Pivotrac
	04:45 PM			1068.85							300	into 4	540	ccw	Pivotrac
	06:30 PM										233	stop			Pivotrac
07/16	07:40 PM										233	start		ccw	Pivotrac
	04:20 PM			1073.49							180		540	move dry	Pivotrac
07/17	11:30 PM			1071.05	1.12	05.0		0.0	07.1	00.0	90	3-E		start ccw	Pivotrac
07/19 07/20	10:55 AM 06:05 AM		1.09	1074.92 1078.95	blister	97.8	21.4	92.6	97.4	98.0	32 0	3-E	536	0.000	Curtis
	06:05 AM 01:05 AM		1.09	1078.95		-					330	into 5 into 4	540 540	ccw ccw	Pivotrac Pivotrac
01/21	51.55 AW	ļ	I	1000.00		I	I		L	I	550	1110 4	540	ccw	1 woulde

Table 25: 2017 Field Data, "3 GPM-Early" LEPA Corn, 221 bu/ac, Krienke

		Rainfall	Irrigation	Water	Growth		So	il Moist	ure		Pivot	Crop	Well	Pivot	Tracking
Date	Time	(inches)	(inches)	Meter	Stage	1 Foot	2 Feet			5 Feet		Irrigated	(GPM)	Rotation	Source
07/21	04:20 PM			1082.38	<u>g</u>						300	into 3	540	ccw	Pivotrac
07/23	02:55 PM			1087.04							180	move dry	540	ccw	Pivotrac
07/24	12:20 AM										90	start		ccw	Pivotrac
07/25	01:05 PM			1088.89	milk	98.0	5.6	45.0	97.3	98.4	28	3-E	531		Curtis
07/26	05:35 AM		1.06	1092.36							0	into 5	540	ccw	Pivotrac
07/27	12:35 AM			1094.26							330	into 4	540	ccw	Pivotrac
07/27	03:35 PM			1095.76							300	into 3	540	ccw	Pivotrac
07/29	04:35 PM			1100.66							180	move dry	540	ccw	Pivotrac
07/29	09:35 PM										90	start		ccw	Pivotrac
08/01	07:00 AM		1.13	1106.30							0	into 5	530	ccw	Pivotrac
08/02	03:45 AM			1108.33							330	into 4	530	ccw	Pivotrac
08/02	10:35 AM	2.25		1106.78	dough	98.7	11.5	33.0	96.5	97.8	316	4	529		Curtis
08/02	08:15 PM			1109.95							300	into 3	530	ccw	Pivotrac
08/04	08:20 PM			1114.67							180	into fallow	530	ccw	Pivotrac
08/05 08/05	08:20 AM 09:50 AM			1115.85							151 180	reverse	530	cw	Pivotrac Pivotrac
08/03	10:20 AM			1120.61							300	start into 4	530	cw	
08/07	02:35 AM			1120.81							330	into 4	530	cw cw	Pivotrac Pivotrac
08/08	11:00 AM	0.11		1122.21	dough	95.4	26.3	34.6	96.0	97.4	343	5	525	cw	Curtis
08/08	10:25 PM	0.11		1124.15	uougn	75.4	20.5	54.0	20.0	77.4	360	into 3-E	530	cw	Pivotrac
08/11	06:50 AM		1.08	1129.59							90	into fallow	530	cw	Pivotrac
08/11	08:50 AM		1.00	1129.79							93	move dry	530	cw	Pivotrac
08/11	01:50 PM			112/11/							180	start	220	cw	Pivotrac
08/13	02:35 PM			1134.58							300	into 4	530	cw	Pivotrac
08/14	06:45 AM			1136.16							330	into 5	530	cw	Pivotrac
08/15	02:30 AM			1138.10							360	into 3-E	530	cw	Pivotrac
08/15	10:25 AM	0.72		1136.52	dough	98.2	33.5	37.2	95.5	97.2	12	3-E	530		Curtis
08/17	11:15 AM		1.11	1143.67							90	into fallow	530	cw	Pivotrac
08/17	12:00 PM			1143.75							92	move dry	530	cw	Pivotrac
08/17	04:45 PM										180	start		cw	Pivotrac
08/18	02:45 AM										204	stop			Pivotrac
08/18	11:00 AM										204	start		cw	Pivotrac
08/20	01:50 AM			1150.89							300	into 4	530	cw	Pivotrac
08/20	05:45 PM			1152.46							330	into 5	530	cw	Pivotrac
08/21	02:00 PM			1154.44							360	into 3-E	530	cw	Pivotrac
08/22	10:25 AM	0.76		1151.62	dent	98.1	38.7	38.9	94.8	96.9	32	3-E	519		Curtis
08/23	11:55 PM		1.07	1159.81							90	move dry	500	cw	Pivotrac
08/25	11:30 AM				-						180	start	-	cw	Pivotrac
08/27	10:55 PM			1165.31							300	into 4	500	cw	Pivotrac
08/28	06:45 PM			1167.15							330	into 5	500	cw	Pivotrac
08/29	03:50 PM		0.70	1169.10							360	into 3-E	500	cw	Pivotrac
08/31	05:35 AM	0.44	0.70	1172.59	17	09.1	52.0	40.0	02.0	06.9	90	3-E	500	cw	Pivotrac
08/31	10:35 AM	0.44		1168.54	1/4 mat line	98.1	52.9	40.0	93.9	96.8	139	move dry		cw	Curtis
08/31 09/03	02:45 PM 02:20 AM			1178.11							180 300	start into 4	500	cw	Pivotrac Pivotrac
09/03	10:30 PM			1179.98							330	into 4	500	cw cw	Pivotrac
09/03	06:55 PM			1181.87							360	into 3-E	500	cw	Pivotrac
09/04	08:00 AM		0.68	1185.31							90	move dry	500	cw	Pivotrac
09/06	12:10 PM		0.08	1165.51							180	start	500	cw	Pivotrac
09/08	10:15 AM			1186.48	⅓ mat line	97.7	52.9	34.4	90.3	96.7	272	3	529	0.11	Curtis
09/08	11:30 PM			1190.08	/s mat mit	21.1	52.7	5	70.5	2017	300	into 4	500	cw	Pivotrac
09/09	07:15 PM			1191.91							330	into 5	500	cw	Pivotrac
09/10	03:50 PM			1193.82							360	into 3-E	500	cw	Pivotrac
09/11	02:25 PM										54	3-E		stop	Pivotrac
	02:40 PM										54	3-E			Pivotrac
	04:55 AM		0.68	1197.23							90	3-E	500		Pivotrac
	09:05 AM										180			start	Pivotrac
09/12	12:45 PM			1195.65	1/2 mat line	95.9	48.0	29.8	85.6	96.8	187	3	541		Curtis
09/14	08:05 PM			1202.69							300	into 4	500	cw	Pivotrac
09/15	03:35 PM			1204.50							330	into 5	500	cw	Pivotrac
09/16	12:35 PM			1206.44							360	into 3-E	500	cw	Pivotrac
	01:30 AM		0.68	1209.86							90	3-E	500	move dry	Pivotrac
09/18	05:40 AM										180	3		start cw	Pivotrac
09/20	02:20 PM	0.26		1214.13	3/4 mat line	98.4	41.4	29.5	82.0	96.2	295	3	530		C & L
09/20	04:45 PM			1215.33							300	into 4 cw	500		Pivotrac
09/21	12:40 PM			1217.18							330	into 5	500		
09/22	10:25 AM			1219.19							360		500	stop	Danny
09/28	02:30 PM			1218.41							0			off	Curtis
10/04	01:35 PM	2.52			black layer	97.7	97.8	33.7	85.9	95.2	1			off	Curtis
10/12	10:30 AM	2.44		1218.41	black layer	97.8	98.3	98.0	95.5	95.9	1			off	Curtis
	10/18 10:40 AM 1218.41 black layer 97.6 98.1 97.8 96.5 96.6 1 off Curtis 10/21 barrent barr														
10/21	10.15.15			1015	harvest	05.5	0.5 -				move dry				Danny
10/25	10:40 AM			1218.41	harvested	97.5	98.0	97.7	96.6	97.0	332			off	Curtis
	11/09 10:50 AM 1218.41 harvested 97.7 97.4 96.5 97.2 9 off Curtis 11/09 10:50 AM 1218.41 harvested 97.1 97.7 97.4 96.5 97.2 9 off Curtis 11/05 10:57 AM 10:91.41 harvested 97.1 97.7 97.2 9 off Curtis														
	11/15 10:25 AM 1218.41 harvested 97.1 97.6 97.2 96.3 97.0 9 off Curtis														
Total	<u> </u>	9.49	18.03			0.0	0.0	0.0	0.0	0.0	= 0.0	Soil Moisture		1	Leon
	noisture is (A NUCC	1 M	0.00 .) in T	a1 337 ·	- (27 -	2 :>					
					il Moisture (0.00 m) IS TO	ai wate	er (27.5	∠ 1n).					
- "inumber	rs in red are	not coun	ied in the t	otai rainfa	ш.										

Table 25: 2017 Field Data, "3 GPM-Early" LEPA Corn, 221 bu/ac, Krienke (continued)

*Numbers in red are not counted in the total rainfall.

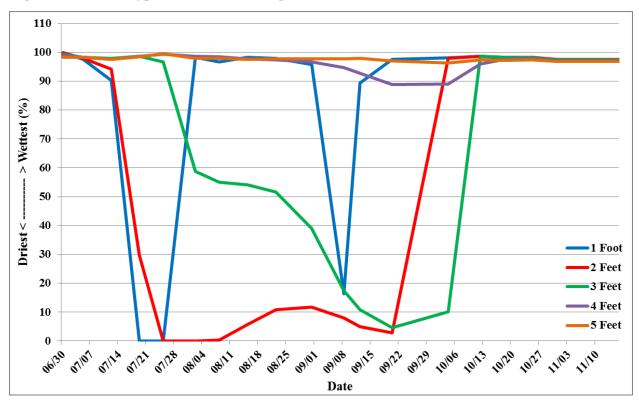
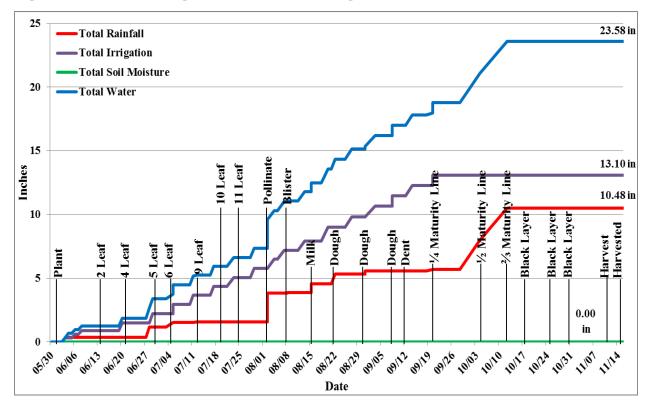


Figure 31: 2017 Gypsum Block Readings, "3 GPM" LEPA Corn, 228 bu/ac, Krienke

Figure 32: 2017 Growing Season Water Tracking, "3 GPM" LEPA Corn, 228 bu/ac, Krienke



		Rainfall	Irrigation	Water	Growth		Sc	il Moistu	ure		Pivot	Crop	Well	Pivot	Tracking
Date	Time	(inches)	(inches)	Meter	Stage	1 Foot	2 Feet	3 Feet	4 Feet	5 Feet	Position	Irrigated	(GPM)	Rotation	Source
04/21		0.91													Pivotrac
04/30		1.19													Pivotrac
05/03		0.78		980.86							234				Pivotrac
05/10	07:15 AM										234				Pivotrac Pivotrac
05/12 05/13	10:00 AM 12:30 PM			980.86							90 90			move dry start ccw	Pivotrac
05/13	02:20 PM			982.30							0	3-E	565	stop	Pivotrac
05/16		0.27										-		stop	Pivotrac
05/19	03:05 PM										0	3-E		start ccw	Pivotrac
05/20	06:10 PM			983.84							90	3-E	600	stop	Pivotrac
05/22		0.32												stop	Pivotrac
05/23		0.26			mlant									move dry	Pivotrac
05/31 06/01	03:10 PM				plant						90	3-E		start ccw	Danny Pivotrac
06/02	06:15 AM			985.56							0	3-E	565	into 5	Tivouae
06/02	11:15 AM			986.08							330	5	565	into 4	Pivotrac
06/02	04:20 PM			986.61							300	4	565	into 3	Pivotrac
06/03	12:35 PM		0.31	988.73							180	3	565	stop	Pivotrac
06/04		0.37													Pivotrac
06/05	07:00 PM		0.28	000.50							180	3	ECE	start cw	Pivotrac
06/06 06/06	12:45 PM 10:55 PM		0.28	990.59 991.65							300 1	3 4 & 5	565 565	into 4 into 3-E	Pivotrac stop
06/00	08:45 AM			//1.05		┼───┤					1		565	start cw	Pivotrac
06/07	10:35 AM			991.74							13	3-E	554	3-E	Curtis
06/07	12:40 PM			992.07							360	3-E	565	into 5	Pivotrac
06/07	05:10 PM			992.54							330	5		into 4	Pivotrac
06/07	09:40 PM		0.00	993.02		\square					300	4	565	into 3	Pivotrac
06/08	04:10 PM		0.29	994.95							180	3	565	stop	Pivotrac
06/10 06/10	02:50 PM 03:10 PM			├───┤	}	┨────┦					90 90	3-E		move dry start ccw	Pivotrac Pivotrac
06/10	03:10 PM			998.03							<u> </u>	3-E 3-E	560	start ccw	Pivotrac
06/12	05:30 PM			770.05							0	3-E	200	start cw	Pivotrac
06/13	11:30 PM			1001.14							90	3-E	560	stop	Pivotrac
06/14	10:05 AM			1000.78	2 leaf						90			off	Curtis
06/15	10:15 AM										90	3-E		start ccw	Pivotrac
06/16	06:00 PM			1004.43							0	3-E	560	reverse	Pivotrac
06/18	01:45 AM			1007.72							90 180	3-E 3	560	move dry	Pivotrac
06/19 06/20	06:55 PM 11:35 AM		0.62	1011.87							300	3	550	start into 4	Pivotrac Pivotrac
06/20	09:20 PM		0.02	1011.87							330	4	550	into 4	Pivotrac
06/21	07:55 AM			1013.93	4 leaf						360	5	550	into 3-E	Pivotrac
06/21	02:35 PM			1013.63							20	3-E	525	3-E	Curtis
06/21	08:50 PM										38	3-E		stop	Pivotrac
06/22	04:30 PM										38	3-E		start cw	Pivotrac
06/22 06/22	07:45 PM										48 48	3-E		stop	Pivotrac
06/22	08:10 PM 10:30 PM										48 55	3-E 3-E		start stop	Pivotrac Pivotrac
06/22	09:10 AM										55	3-E		start cw	Pivotrac
06/22	09:10 AM			1017.04							90	3-E	550	reverse	Pivotrac
06/26	06:45 AM			1022.91							0	3-E	550	into 5	Pivotrac
06/27	02:20 AM			1024.90							330	5	550	into 4	Pivotrac
06/27	05:45 PM			1026.47							300	4	550	into 3	Pivotrac
06/28	11:00 AM	0.78	0.72	1026.57	5 leaf						257	3	548	3	Curtis
06/29	05:35 PM 10:35 PM		0.73	1031.34 1031.85							180 90	3 fallow	550 550	3 into 3-E	Pivotrac Pivotrac
06/29	10:33 PM 10:30 AM	1		1051.65	5 leaf	99.8	99.9	99.3	98.9	98.3	20	TanOw	550	Into 5-E	Curtis
-	05:35 AM	·		1037.46						2 0.0	0	3-E	550	into 5	Pivotrac
07/03	12:40 AM			1039.40							330	5	550	into 4	Pivotrac
07/03	04:15 PM			1040.99							300	4	550	into 3	Pivotrac
07/05	11:40 AM	0.36		1043.37	6 leaf	97.5	97.9	98.3	98.2	98.3	189	3	550	3	Curtis
07/05	03:30 PM		0.72	1045.80							180	3	550	move dry	Pivotrac
07/05 07/08	11:40 PM 09:10 AM		┝───┦	1051.65		┥───┤					90 0	3-E 3-E	550	start ccw into 5	Pivotrac Pivotrac
07/08	09:10 AM 04:00 AM			1051.65		+					330	5-E	550	into 5 into 4	Pivotrac
07/10	07:25 PM			1055.14							300	4	550	into 4	Pivotrac
07/11	06:10 PM		0.71	1059.90							180	3	550	move dry	Pivotrac
07/11	11:15 PM										90	3-E		start ccw	Pivotrac
	09:30 AM	0.06		1058.77	9 leaf	90.3	94.1	97.9	97.6	97.5	75	3-E	546	3-E	Curtis
07/14	06:40 AM		┞────┦	1065.45		└───┘					0	3-E	540	into 5	Pivotrac
	01:30 AM			1067.33		───					330	5	540	into 4	Pivotrac
07/15 07/16	04:45 PM 06:30 PM			1068.85							300 233	4 3	540	into 3	Pivotrac Pivotrac
07/16	06:30 PM 07:40 PM		┝───┦	┢───┤		┟───┤					233	3		stop start ccw	Pivotrac Pivotrac
07/10	07.40 PM		0.69	1073.49		┨───┤					180	3	540	move dry	Pivotrac
07/17	11:30 PM										90	3-E		start	Pivotrac
07/19	10:55 AM			1074.92	10 leaf	0.0	29.8	98.6	98.6	98.4	32	3-E	536	3-E	Curtis
07/20	06:05 AM			1078.95	1			I			0	3-E	540	into 5	Pivotrac
07/20	01:05 AM			1080.85		-					330	5	540		Pivotrac

Table 26: 2017 Field Data, "3 GPM" LEPA Corn, 228 bu/ac, Krienke

basis Time Balantal Figure Total Journet Picol Total Corp Wind Total Picol Total Picol Total Picol			Rainfall	Irrigation	Water	Growth			il Moist			Pivot	Crop	Well	Pivot	Tracking
0721 0320 M 0 082.8 N N N N	Date	Time		Irrigation (inches)			1 Foot				5 Feet		· ·			0
10721 10321 1087104 1087104 1087104 100 100 00 <td>07/21</td> <td>04·20 PM</td> <td>(menes)</td> <td>(menes)</td> <td></td> <td>Blage</td> <td>11000</td> <td>2 1 000</td> <td>5100</td> <td>4 1 000</td> <td>51000</td> <td></td> <td></td> <td></td> <td></td> <td></td>	07/21	04·20 PM	(menes)	(menes)		Blage	11000	2 1 000	5100	4 1 000	51000					
19724 10.2 10.2 10.4 10 10 00 0.5.7 10.3 10.5.8 11.8 10.8 11.8 10.8 10.9 <				0.70												
1972 1012 1012 1012 100 1															5	
0726 0533 A.S. Implement 1mplement					1088.89	11 leaf	0.0	0.0	96.7	99.4	99.6			531		
0727 D.33 A.M. D.904, 26 A.M. A.M. Protects 0728 D.35 P.M. O.75 D.905, 6 A.M. A.M. Protects Protects 0720 D.935 FNA C. O.75 D.905, 7 A.M. D.905, 7 Protects Protects 0700 D.935 FNA C. D.75 D.905, 7 D.905, 7 </td <td></td>																
0729 03.39 PM 0.73 1100.6 □ □ □ □ 0.0 0.					1094.26							330	5	540	into 4	Pivotrac
mode <	07/28	03:35 PM			1095.76							300	4	540	into 3	Pivotrac
BACH COND AM I <	07/29	04:35 PM		0.73	1100.66							180	3	540	move dry	Pivotrac
Nonce	07/30	09:35 PM										90	3-E		start	Pivotrac
BODD BODD BODD BODD BODD BODD BODD A A A SOD BODD A A SOD BODD	08/01	07:00 AM			1106.30							0	3-E	530	into 5	Pivotrac
0802 0815 PM 0.1 1100-95 0.1 0.1 0.10 0.1 0.50 M.0.2 1114.67 0.1 0.1 1115.85 0.1 0.1 1100.01 1100.01 1115.85 0.1 0.1 1115.85 0.1 0.1 1110.01 1110.01 1100.01 1110.01 1100.01	08/02	03:45 AM			1108.33							330	5	530	into 4	Pivotrac
0600 0820 M 0.71 111.6.7 I </td <td>08/02</td> <td>10:35 AM</td> <td>2.25</td> <td></td> <td>1106.78</td> <td>pollinate</td> <td>98.3</td> <td>0.0</td> <td>58.7</td> <td>98.6</td> <td>98.0</td> <td>316</td> <td>4</td> <td>529</td> <td>3</td> <td>Curtis</td>	08/02	10:35 AM	2.25		1106.78	pollinate	98.3	0.0	58.7	98.6	98.0	316	4	529	3	Curtis
0800 0820 All I 118.8 I I <th< td=""><td>08/02</td><td>08:15 PM</td><td></td><td></td><td>1109.95</td><td></td><td></td><td></td><td></td><td></td><td></td><td>300</td><td></td><td>530</td><td>into 3</td><td>Pivotrac</td></th<>	08/02	08:15 PM			1109.95							300		530	into 3	Pivotrac
Books Books <th< td=""><td>08/04</td><td>08:20 PM</td><td></td><td>0.71</td><td>1114.67</td><td></td><td></td><td></td><td></td><td></td><td></td><td>180</td><td>3</td><td>530</td><td>intofallow</td><td>Pivotrac</td></th<>	08/04	08:20 PM		0.71	1114.67							180	3	530	intofallow	Pivotrac
0800 0.200 AM 0.71 112.0.61 N	08/05	08:20 AM			1115.85							151	fallow	530	reverse	Pivotrac
0000 0235 AM I 112.01 I I I 0 I 0 I 0 I 0 I 0 <	08/05	09:50 AM													start	Pivotrac
0808 1100 AM 0.00 1112 ALS Non-R 90.7 0.4 50 90.7 34.3 4.4 525 4. Curis 0811 1056 AM 1124.15 1129.79 0 1 100 AM 530 nino 5.E Pivotrac 0811 1057 AM 0 1129.79 0 1 0 3 30 nino 5.E Pivotrac 0814 10523 PN 0 0.7 1134.85 0 0 0 3.0 3.0 nino 5.E Pivotrac 0814 10232 PN 0.7 1136.52 mik 9.0 5.6 5.0 9.7 9.6 1.2 3.8 5.30 nino 5.E Pivotrac 0817 1315.04 0.00 1136.52 mik 9.0 5.0 1.00 3.8 1.00 1.01 1.01 1.01 1.01 1.01 1.01 1.02 1.02 1.02 1.02 1.01 1.01 1.01 1.01 1.01 1.01 1.01 1.01 1.01 1.01 1.01 1.01 1.01	08/07	10:20 AM		0.71											into 4	Pivotrac
00000 01/22 FM I 1129.59 I	08/08														into 5	Pivotrac
08:11 08:50 AM 1 1129.79 A I I I I I Inter failed Pivotras 08:11 113.50 M 0.72 113.4.88 A A A S3 Into Pivotras 08:13 05:55 M 0.72 113.4.88 A A S30 Into Pivotras 08:13 05:55 M 0.72 113.6.8 A S30 Into Pivotras 08:13 05:50 M 0.69 N N Pivotras Pivotras 08:17 10:00 M 1145.75 C C C N N S30 A S30 Pivotras 08:17 1145.47 C A C A A S30 A A S30 A A S30 A A A A A A A A A A A A A			0.06			blister	96.7	0.4	55.0	98.5	97.9					
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00:10 01:50 PM 0.7.2 134.58 0 0 0 100 3 5.00 1.00 Protract 08:14 06:51 AM 1136.16 0 0 1.00 3.00 4.150.01 Protract 08:15 00:20 AM 1138.1 0 1.01 5.00 1.01 5.00 1.01 S.00 N.1E Currint Currint Protract 00/17 0.43 P.01 1.11 1.11 N.1 N.1 N.1 Protract <		06:50 AM														
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Table 26: 2017 Field Data, "3 GPM" LEPA Corn, 228 bu/ac, Krienke (continued)

Rainfall (9.49 in), Irrigation (18.03 in), and Net Soil Moisture (0.00 in) is Total Water (23.58 in). *Numbers in red are not counted in the Total Rainfall.

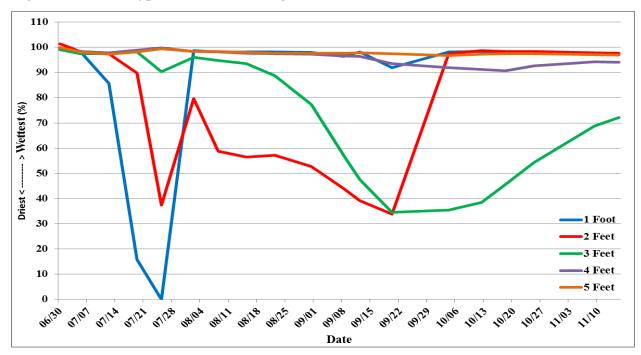
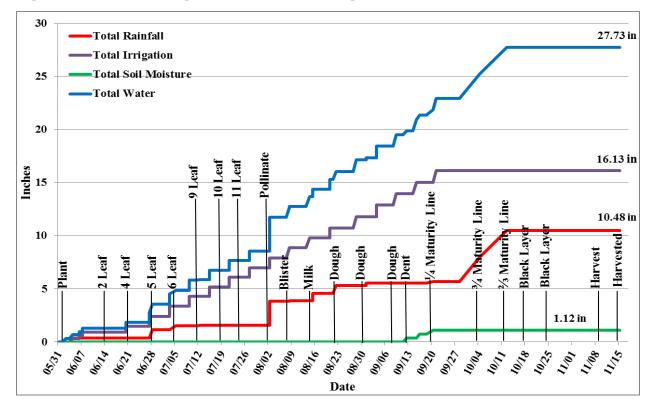


Figure 33: 2017 Gypsum Block Readings, "4 GPM" LEPA Corn, 243 bu/ac, Krienke

Figure 34: 2017 Growing Season Water Tracking, "4 GPM" LEPA Corn, 243 bu/ac, Krienke



Date Date Conce State Field State Field State			Rainfall	Irrigation	Water	Growth	r —	Soi	l Moist	ure		Pivot		Well	Pivot	Tracking
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07/02 05:35 AM 1037.46 Image: constraint of the start 1037.46 Image: constraint of the start 91/000000000000000000000000000000000000	-				1051.65	5 leaf	99.8	101 4	99.0	99.8	100.0	90	TailOW	550	шю э-е	
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07/05 11:40 AM 0.36 1043.37 6 leaf 98.4 97.5 98.3 98.1 189 3 550 3 Curtis 07/05 03:30 PM 1045.80 1045.80 180 3 550 move dry Pivotrac 07/05 11:40 PM 1051.65 180 3 550 into 5 pivotrac 07/08 09:10 AM 1051.65 1053.57 1 0 3-E 550 into 4 Pivotrac 07/09 07:25 PM 0.93 1055.14 1 300 4 550 into 4 Pivotrac 07/11 06:10 PM 1059.90 180 3 550 into 4 Pivotrac 07/12 09:30 AM 0.06 1058.77 9 leaf 85.6 97.4 97.5 97.8 97.3 75 3-E 546 3-E Curtis 07/12 09:30 AM 0.06 1058.77 9 leaf 85.6 97.4 97.5 97.8	07/03	12:40 AM			1039.40							330	5	550		Pivotrac
07/05 03:30 PM 1045.80 1045.80 180 3 550 move dry Pivotrac 07/05 11:40 PM 1051.65 10 90 3-E start Pivotrac 07/08 09:10 AM 1051.65 10 0 3-E 550 into 5 Pivotrac 07/09 04:00 AM 1053.57 10 330 5 550 into 3 Pivotrac 07/10 07:25 PM 0.93 1055.14 10 300 4 550 into 3 Pivotrac 07/11 06:10 PM 1059.90 1055.14 180 3 550 move dry Pivotrac 07/11 11:15 PM 1059.77 9 leaf 85.6 97.4 97.5 97.8 97.3 75 3-E start Pivotrac 07/12 09:30 AM 0.06 1058.77 9 leaf 85.6 97.4 97.5 97.8 97.3 75 3-E 546 3-E Curtis				0.94			0.7	0.7	0-	0.7	0.7					
07/05 11:40 PM model			0.36			6 leaf	98.4	98.4	97.5	98.3	98.1					
07/08 09:10 AM 1051.65 0 0 3-E 550 into 5 Pivotrac 07/09 04:00 AM 1053.57 0 0 330 5 550 into 4 Pivotrac 07/09 07:25 PM 0.93 1055.14 0 330 4 550 into 3 Pivotrac 07/10 06:10 PM 1059.90 0 180 3 550 mov dry Pivotrac 07/11 11:15 PM 0 90 3-E start Pivotrac 07/12 09:30 AM 0.06 1058.77 9 leaf 85.6 97.4 97.5 97.8 97.3 75 3-E 546 3-E Curris 07/14 06:40 AM 1065.45 0 0 3-E 540 into 5 Pivotrac 07/15 01:30 AM 1067.33 0 330 5 540 into 4 Pivotrac 07/16 06:30 PM 0.90 1068.85 0					1045.80									550		
07/09 04:00 AM 1053.57 Image: constraint of the start 1053.57 Image: constraint of the start 91000000000000000000000000000000000000	-				1051.65									550		
07/11 06:10 PM 1059.90 1059.90 180 3 550 move dry Pivotrac 07/11 11:15 PM 11:15 PM 90 3-E start Pivotrac 07/12 09:30 AM 0.06 1058.77 9 leaf 85.6 97.4 97.5 97.8 97.3 75 3-E 546 3-E Curtis 07/14 06:40 AM 1065.45 0 0 3-E 540 into 5 Pivotrac 07/15 01:30 AM 1067.33 0 330 5 540 into 4 Pivotrac 07/15 04:45 PM 0.90 1068.85 0 0 2333 3 stop Pivotrac 07/16 06:30 PM 0 0 233 3 stop Pivotrac 07/17 04:20 PM 1073.49 0 0 233 3 start Pivotrac 07/17 04:20 PM 1073.49 9 90 3-E start																
07/11 11:15 PM mode mode <thmode< th=""></thmode<>	-			0.93												
07/12 09:30 AM 0.06 1058.77 9 leaf 85.6 97.4 97.3 75 3-E 546 3-E Curtis 07/14 06:40 AM 1065.45 0 3-E 540 into 5 Pivotrac 07/15 01:30 AM 1067.33 330 5 540 into 4 Pivotrac 07/15 04:45 PM 0.90 1068.85 300 4 540 into 3 Pivotrac 07/16 06:30 PM 233 3 stop Pivotrac 07/16 07:40 PM 233 3 stop Pivotrac 07/17 04:20 PM 1073.49 180 3 540 into 4 Pivotrac 07/17 11:30 PM 1073.49 90 3-E start Pivotrac 07/19 10:55 AM 1074.92 10 leaf 15.8 89.7<					1059.90									550		
07/14 06:40 AM 1065.45 Image: constraint of the system 0 3-E 540 into 5 Pivotrac 07/15 01:30 AM 1067.33 Image: constraint of the system 330 5 540 into 4 Pivotrac 07/15 01:30 AM 0.90 1068.85 Image: constraint of the system 330 5 540 into 4 Pivotrac 07/16 06:30 PM Image: constraint of the system 1067.33 Image: constraint of the system 107.17 107.16 07.40 PM Image: constraint of the system 107.17 11:30 PM Image: constraint of the system 1073.49 Image: constraint of the system 107.17 10:455 AM 1074.92 10 leaf 15.8 89.7 98.1 98.8 98.2 32 3-E 536 3-E Curtis			0.06		1058 77	Q loof	85.6	07.4	07.5	07 º	07.2			546		
07/15 01:30 AM 1067.33 Image: constraint of the system 330 5 540 into 4 Pivotrac 07/15 04:45 PM 0.90 1068.85 Image: constraint of the system 300 4 540 into 3 Pivotrac 07/16 06:30 PM Image: constraint of the system 233 3 Stop Pivotrac 07/16 07:40 PM Image: constraint of the system 233 3 Stop Pivotrac 07/17 04:20 PM Image: constraint of the system Image: constraint of the system Pivotrac Pivotrac 07/17 11:30 PM Image: constraint of the system Pivotrac Pivotrac 07/19 10:55 AM Image: constraint of the system Image: constraint of the system Pivotrac Pivotrac 07/19 10:55 AM Image: constraint of the system Image: constraint of the system Pivotrac			0.06			9 iear	0.0	97.4	97.5	97.8	97.3					
07/15 04:45 PM 0.90 1068.85 Image: constraint of the system of th																
07/16 07:40 PM 0 233 3 start Pivotrac 07/17 04:20 PM 1073.49 0 0 180 3 540 move dry Pivotrac 07/17 11:30 PM 0 0 0 90 3-E start Pivotrac 07/19 10:55 AM 1074.92 10 leaf 15.8 89.7 98.1 98.8 98.2 32 3-E 536 3-E Curtis	-	04:45 PM		0.90								300	4			
07/17 04:20 PM 1073.49 Image: Marcol Mar																
07/17 11:30 PM Image: Constraint of the start Pivotrac 07/19 10:55 AM 1074.92 10 leaf 15.8 89.7 98.1 98.8 98.2 32 3-E Start Pivotrac					1072.15											
07/19 10:55 AM 1074.92 10 leaf 15.8 89.7 98.1 98.8 98.2 32 3-E 536 3-E Curtis			1		1073.49									540		
					1074.92	10 leaf	15.8	89.7	98.1	98.8	98.2			536		
	07/20	06:05 AM			1074.92	10 Юш	10.0	57.1	20.1	20.0	20.2	0	3-E 3-E	540	into 5	Pivotrac

Table 27: 2017 Field Data, "4 GPM" LEPA Corn, 243 bu/ac, Krienke

labic	21. 20		iu Dui	u, - (,	Jua	uc, m		Jiitiitu	cu)	
-		Rainfall	Irrigation	Water	Growth		Soi	il Moist	ure		Pivot		Well	Pivot	Tracking
Date	Time	(inches)	(inches)	Meter	Stage	1 Foot			4 Feet	5 Feet		Crop Irrigate	(GPM)	Rotation	Source
07/21	01:05 AM			1080.85							330	5	540	into 4	Pivotrac
07/21	04:20 PM		0.90	1082.38							300	4	540	into 4	Pivotrac
-			0.90												
07/23	02:55 PM			1087.04							180	3	540	move dry	Pivotrac
07/24	12:20 AM										90	3-E		start	Pivotrac
07/25	01:12 PM			1088.89	11 leaf	0	37.4	90.3	99.7	99.4	28	3-E	531	3-E	Curtis
07/26	05:35 AM			1092.36							0	3-E	540	into 5	Pivotrac
07/27	12:35 AM			1094.26							330	5	540	into 4	Pivotrac
07/27	03:35 PM		0.88	1095.76							300	4	540	into 3	Pivotrac
07/29	04:35 PM			1100.66							180	3	540	move dry	Pivotrac
07/29	09:35 PM										90	3-E		start	Pivotrac
08/01	07:00 AM			1106.30							0	3-E	530	into 5	Pivotrac
08/02	03:45 AM			1108.33							330	5	530	into 4	Pivotrac
08/02	10:35 AM	2.25		1106.78	pollinate	98.6	79.7	96.0	98.4	98.4	316	4	529	3	Curtis
08/02	08:15 PM		0.95	1109.95							300	4	530	into 3	Pivotrac
08/04	08:20 PM			1114.67							180	3	530	intofallow	Pivotrac
08/05	08:20 AM			1115.85							151	fallow	530	reverse	Pivotrac
08/05	09:50 AM										180	3	1	start	Pivotrac
08/07	10:20 AM			1120.61							300	3	530	into 4	Pivotrac
08/08	02:35 AM		0.94	1122.21							330	4	530	into 5	Pivotrac
		0.06	0.94		h lintan	08.1	50 7	04.9	08.1	98.3		4		4	
08/08	11:00 AM	0.06		1120.67	blister	98.1	58.7	94.8	98.1	98.5	343		525		Curtis
08/08	10:25 PM			1124.15							360	5	530	into 3-E	Pivotrac
08/11	06:50 AM			1129.59							90	3-E	530	intofallow	Pivotrac
08/11				1129.79				L	L	L	93	fallow	530	move dry	Pivotrac
08/11	01:50 PM			L							180	3		start	Pivotrac
08/13	02:35 PM			1134.58							300	3	530	into 4	Pivotrac
08/13	06:45 AM		0.94	1136.16							330	4	530	into 5	Pivotrac
08/14	02:30 AM			1138.1	1						360	5	530	into 3-E	Pivotrac
		0.60			m:11.	08.1	56 5	02 6	07.7	08.0					
08/15	10:25 AM	0.69		1136.52	milk	98.1	56.5	93.6	97.7	98.0	12	3-E	530	3-E	Curtis
08/17	11:15 AM			1143.67							90	3-E	530	intofallow	Pivotrac
08/17	12:00 PM			1143.75							92	fallow	530	move dry	Pivotrac
08/17	04:45 PM										180	3		start	Pivotrac
08/18	02:45 AM										204	3	1	stop	Pivotrac
08/18	11:00 AM										204	3	1	start	Pivotrac
08/20	01:50 AM			1150.89							300	3	530	into 4	Pivotrac
08/20	05:45 PM		0.92	1152.46							330	4	530	into 5	Pivotrac
08/20	02:00 PM		0.72	1154.44							360	5	530	into 3-E	Pivotrac
		0.76			1 1	00.1	67.0	00.7	07.4	07.7					
08/22	10:25 AM	0.76		1151.62	dough	98.1	57.2	88.7	97.4	97.7	32	3-E	519	3-E	Curtis
08/23	11:55 PM			1159.81							90	3-E	500	move dry	Pivotrac
08/25	11:30 AM										180	3	Ļ	start	Pivotrac
08/27	10:55 PM			1165.31							300	3	500	into 4	Pivotrac
08/28	06:45 PM		1.08	1167.15							330	4	500	into 5	Pivotrac
08/29	03:50 PM			1169.10							360	5	500	into 3-E	Pivotrac
08/31	05:35 AM			1172.59							90	3-E	500	move dry	Pivotrac
08/31	10:35 AM	0.22		1168.54	dough	97.9	52.7	77.3	97.2	97.6	139	fallow	200	move dry	Curtis
		0.22		1100.54	uougn	71.7	52.7	11.5	71.2	77.0					
08/31	02:45 PM			1170.11							180	3	500	start	Pivotrac
09/03	02:20 AM			1178.11							300	3	500	into 4	Pivotrac
09/03	10:30 PM		1.10	1179.98							330	4	500	into 5	Pivotrac
09/04	06:55 PM			1181.87							360	5	500	into 3-E	Pivotrac
09/06	08:00 AM			1185.31							90	3-E	500	move dry	Pivotrac
09/06	12:10 PM										180	3	1	start	Pivotrac
09/08	10:15 AM			1186.48	dough	96.4	44.0	57.1	96.6	97.6	272	3	529	3	Curtis
09/08	11:30 PM			1190.08							300	3	500	into 4	Pivotrac
09/09	07:15 PM		1.08	1191.91							330	4	500	into 5	Pivotrac
	03:50 PM		1.08	1191.91										into 3-E	
09/10				1193.82							360	5	500		Pivotrac
09/11	02:25 PM			l							54	3-E		stop	Pivotrac
09/11	02:40 PM	1						l	l	l	54	3-E		start	Pivotrac
	04:55 AM			1197.23							90	3-E	500	move dry	Pivotrac
09/12	09:05 AM										180	3		start	Pivotrac
09/12	12:50 PM			1195.65	dent	98.2	39.1	47.6	96.3	97.8	187	3	541	3	Curtis
09/14	08:05 PM			1202.69							300	3	500	into 4	Pivotrac
09/15	03:35 PM		1.06	1204.50							330	4	500	into 5	Pivotrac
09/15	12:35 PM			1204.50							360	5	500	into 3-E	Pivotrac
09/18	01:30 AM			1208.44							90	3-E	500		Pivotrac
-				1209.80									500	move dry	
09/18	05:40 AM	0.1-		101.1.1			aa -	a	0.7 -	07 -	180	3		start	Pivotrac
09/20	02:20 PM	0.15			¼ mat line	92.0	33.9	34.6	93.6	97.5	295	3	530	3	C & L
09/20	04:45 PM			1215.33							300	3	500	into 4	Pivotrac
09/21	12:40 PM		1.09	1217.18							330	4	500	into 5	Pivotrac
09/22	10:25 AM		1	1219.19							360	5	500	stop	Pivotrac
09/28	02:30 PM			1218.41							0			off	Danny
10/04	01:35 PM	2.30	1		¾ mat line	98.2	97.4	35.4	91.9	96.7	1		·	off	Curtis
10/04	10:30 AM	2.30		1218.41	⅔ mat line	98.4	98.6	38.5	91.9	97.2	1			off	Curtis
		∠.48													
10/18	10:40 AM			1218.41	black layer		98.4	45.6	90.6	97.4	1		ı — — —	off	Curtis
10/25	10:00 AM			1218.41	black layer	97.8	98.3	54.4	92.7	97.4	332	3-E		off	Curtis
10/31	11:25 AM			1218.41							332			off	Curtis
10/31	08:15 AM													move dry	Pivotrac
11/09	10:50 AM			1218.41	black layer	97.0	97.8	68.7	94.2	97.1	9			off	Curtis
11/09				1	harvest										Danny
11/09	10:25 AM			1218.41	harvested	97.0	97.6	72.1	94.1	96.9				off	Curtis
	10.25 AM	10.49	16.12		narvested						1.10"	C-IM :		011	
Total		10.48	16.13	1218.41		0.00	0.00	0.82	0.30	0.00	= 1.12"	Soil Moisture			Leon
	oisture is 1.														
Rainfall (10	0.48 in), irri	gation (16.	13 in), and	net soil mo	isture (1.12	in) is to	otal wat	ter (27.	73 in).						

Table 27: 2017 Field Data, "4 GPM" LEPA Corn, 243 bu/ac, Krienke (continued)

*Numbers in red are not counted in the total rainfall.

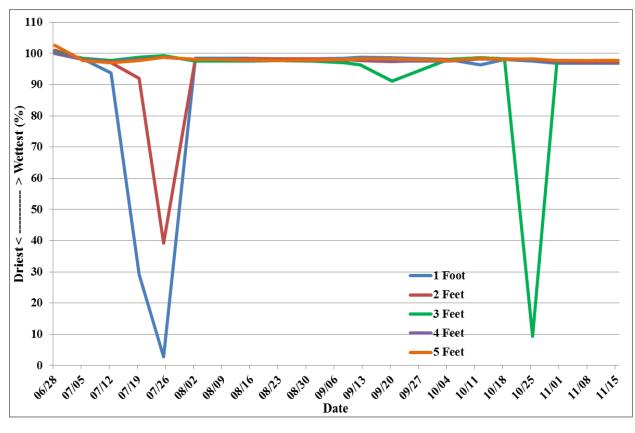
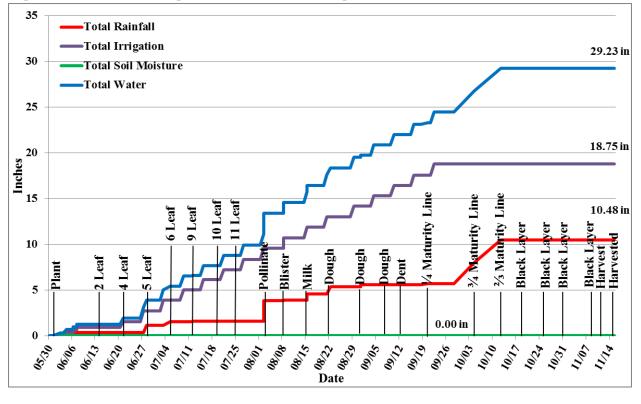


Figure 35: 2017 Gypsum Block Readings, "5 GPM" LEPA Corn, 244 bu/ac, Krienke

Figure 36: 2017 Growing Season Water Tracking, "5 GPM" LEPA Corn, 244 bu/ac, Krienke



						1									
Date	Time		Irrigation	Water	Growth			il Moist		<i>4</i> D	Pivot	Crop Irrigate	Well	Pivot	Tracking
		(inches)	(inches)	Meter	Stage	1 Foot	2 Feet	3 Feet	4 Feet	5 Feet	Position	1 0	(GPM)	Rotation	Source
04/21 04/30		0.91 1.19													Pivotrac
04/30		0.78		980.86							234				Pivotrac
05/05	07:15 AM	0.78		980.80							234				Pivotrac Pivotrac
05/10	10:00 AM										90			move dry	Pivotrac
05/12	12:30 PM			980.86							90 90			start	Pivotrac
05/13	02:20 PM			982.30							0	3-E	565	stop	Pivotrac
05/14	02.201111	0.27		782.50							0	3-L	505	stop	Pivotrac
05/19	03:05 PM	0.27									0	3-E		start	Pivotrac
05/20	06:10 PM			983.84							90	3-E	600	stop	Pivotrac
05/22	00.101.01	0.32		202.01							20	52	000	stop	Pivotrac
05/23		0.26												move dry	Pivotrac
05/31				-	plant										Danny
06/01	03:10 PM				1						90	3-E		start	Pivotrac
06/02	06:15 AM			985.56							0	3-E	565	into 5	
06/02	11:15 AM		0.31	986.08							330	5	565	into 4	Pivotrac
06/02	04:20 PM			986.61							300	4	565	into 3	Pivotrac
06/03	12:35 PM			988.73							180	3	565	stop	Pivotrac
06/04		0.37													Pivotrac
06/05	07:00 PM										180	3		start	Pivotrac
06/06	12:45 PM			990.59							300	3	565	into 4	Pivotrac
06/06	10:55 PM		0.31	991.65							1	4 & 5	565	into 3-E	stop
06/07	08:45 AM										1		565	start	Pivotrac
06/07	10:35 AM			991.74							13	3-E	554	3-E	Curtis
06/07	12:40 PM			992.07							360	3-E	565	into 5	Pivotrac
06/07	05:10 PM		0.28	992.54							330	5		into 4	Pivotrac
06/07	09:40 PM			993.02							300	4	565	into 3	Pivotrac
06/08	04:10 PM			994.95							180	3	565	stop	Pivotrac
06/10	02:50 PM										90			move dry	Pivotrac
06/10	03:10 PM										90	3-E		start	Pivotrac
06/11	08:50 PM			998.03							0	3-E	560	stop	Pivotrac
06/12	05:30 PM										0	3-E		start	Pivotrac
06/13	11:30 PM			1001.14							90	3-E	560	stop	Pivotrac
06/14	10:05 AM			1000.78	2 leaf						90			off	Curtis
06/15	10:15 AM										90	3-E		start ccw	Pivotrac
06/16	06:00 PM			1004.43							0	3-E	560	reverse	Pivotrac
06/18	01:45 AM			1007.72							90	3-E	560	move dry	Pivotrac
06/18	06:55 PM										180	3		start cw	Pivotrac
06/20	11:35 AM			1011.87							300	3	550	into 4	Pivotrac
06/20	09:20 PM		0.64	1012.86							330	4	550	into 5	Pivotrac
06/21	07:55 AM		0.64	1013.93	41.6						360	5	550	into 3-E	Pivotrac
06/21	02:35 PM			1013.63	4 leaf						20	3-E	525	3-E	Curtis
06/21	08:50 PM										38 38	3-E		stop	Pivotrac
06/22	04:30 PM											3-E		start cw	Pivotrac
06/22 06/22	07:45 PM										48 48	2 0		stop	Pivotrac
06/22	08:10 PM 10:30 PM										48 55	3-E 3-E		start cw	Pivotrac Pivotrac
06/22												3-E 3-E		stop start cw	
06/23	09:10 AM 09:10 AM			1017.04							55 90	3-E 3-E	550	reverse	Pivotrac Pivotrac
06/23	06:45 AM			1017.04							90 0	3-E 3-E	550	into 5 ccw	Pivotrac
06/20	02:20 AM		1.18	1022.91							330	5	550	into 5 ccw	Pivotrac
06/27	02:20 AM 05:45 PM		1.10	1024.90							300	4	550	into 4	Pivotrac
-	11:00 AM	0.78		1026.47	5 leaf	100.5	101.1	100.2	99.0	102.5	257	3	548	3 Into 3	Curtis
06/28	05:35 PM	0.70		1026.37	Jindi	100.5	101.1	100.3	11.7	104.3	180	3	550	3	Pivotrac
06/29	10:35PM			1031.34	·						90	fallow	550	into 3-E	Pivotrac
07/02	05:35 AM			1031.85							90 0	3-E	550	into 5	Pivotrac
07/02	12:40 AM	-	1.15	1037.40		1					330	5	550	into 3	Pivotrac
07/03	04:15 PM			1039.40			-				300	4	550	into 4	Pivotrac
07/05	11:40 AM	0.36		1043.37	6 leaf	98.3	98.1	98.4	98.1	97.7	189	3	550	3	Curtis
07/05	03:30 PM	0.50		1045.80	0.000	20.5	20.1	20.4	20.1		189	3	550	move dry	Pivotrac
07/05	11:40 PM			10.00							90	3-E	250	start ccw	Pivotrac
07/08	09:10 AM			1051.65							0	3-E 3-E	550	into 5	Pivotrac
07/09	04:00 AM		1.13	1053.57							330	5	550	into 3	Pivotrac
07/09	07:25 PM			1055.14							300	4	550	into 4	Pivotrac
07/11	06:10 PM			1059.90							180	3	550	move dry	Pivotrac
07/11	11:15 PM										90	3-E	200	start ccw	Pivotrac
07/12	09:30 AM	0.06		1058.77	9 leaf	93.7	97.1	97.8	97.3	97.0	75	3-E 3-E	546	3-E	Curtis
07/12	06:40 AM			1065.45							0	3-E	540	into 5	Pivotrac
07/15	01:30 AM		1.11	1067.33							330	5	540	into 3	Pivotrac
07/15				1068.85							300	4	540	into 4	Pivotrac
07/16	06:30 PM										233	3	2.10	stop	Pivotrac
-											233	3		start ccw	Pivotrac
07/17	04:20 PM			1073.49							180	3	540	move dry	Pivotrac
07/17	11:30 PM			10, 5.47							90	3-E	2.40	start	Pivotrac
	10:55 AM			1074.92	10 leaf	29.1	92.0	98.7	98.0	97.8	32	3-E 3-E	536	3-E	Curtis
	06:05 AM	-		1074.92	10 Kai		22.0	20.7	20.0	21.0	0	3-E 3-E	540	into 5	Pivotrac
-	01:05 AM		1.12	1078.95			-				330	5	540	into 3	Pivotrac
07/21	01.05 AW	l	1.12	1000.05		1	I			I	550	5	540	1110 4	1 ivouac

Table 28: 2017 Field Data, "5 GPM" LEPA Corn, 244 bu/ac, Krienke

		Rainfall	Irrigation	Water	Growth		So	il Moist	ure		Pivot		Well	Pivot	Tracking
Date	Time	(inches)	(inches)	Meter	Stage	1 Foot		3 Feet		5 Feet	Position	Crop Irrigate	(GPM)	Rotation	Source
07/21	04:20 PM	<u>`</u>	· · · · ·	1082.38	0						300	4	540	into 3	Pivotrac
07/23	02:55 PM			1087.04							180	3	540	move dry	Pivotrac
07/24	12:20 AM										90	3-E		start ccw	Pivotrac
07/25	01:12 PM			1088.89	11 leaf	2.8	39.2	99.2	98.8	98.8	28	3-E	531	3-E	Curtis
07/26	05:35 AM			1092.36							0	3-E	540	into 5	Pivotrac
07/27	12:35 AM		1.12	1094.26							330	5	540	into 4	Pivotrac
07/27	03:35 PM 04:35 PM			1095.76 1100.66							300 180	4 3	540 540	into 3	Pivotrac
07/29 07/29	04:33 PM 09:35 PM			1100.66							90	3-E	540	move dry start ccw	Pivotrac Pivotrac
07/29	07:00 AM			1106.30							0	3-E 3-E	530	into 5	Pivotrac
08/02	03:45 AM		1.20	1108.33							330	5	530	into 4	Pivotrac
08/02	10:35 AM	2.25	1.20	1106.78	pollinate	98.4	98.3	97.5	98.1	98.1	316	4	529	3	Curtis
08/02	08:15 PM			1109.95	Pointer		2010	2.10	7 010	7 010	300	4	530	into 3	Pivotrac
08/04	08:20 PM			1114.67							180	3	530	into fallow	Pivotrac
08/05	08:20 AM			1115.85							151	fallow	530	reverse	Pivotrac
08/05	09:50 AM										180	3		start cw	Pivotrac
08/07	10:20 AM			1120.61							300	3	530	into 4	Pivotrac
08/08	02:35 AM			1122.21							330	4	530	into 5	Pivotrac
08/08	11:00 AM	0.06		1120.67	blister	98.5	97.9	97.5	98.0	98.0	343	4	525	5	Curtis
08/08	10:25 PM		1.15	1124.15							360	5	530	into 3-E	Pivotrac
08/11	06:50 AM			1129.59							90	3-E	530	into fallow	Pivotrac
08/11 08/11	01:50 PM			1129.79							93 180	fallow 3	530	move dry	Pivotrac
	02:35 PM			1134.58							300	3	520	start cw	Pivotrac Bivotrac
08/13 08/14	02:35 PM 06:45 AM			1134.58							330	4	530 530	into 4 into 5	Pivotrac Pivotrac
08/14	08:43 AM 02:30 AM		1.14	1138.10		<u> </u>					360	5	530	into 3-E	Pivotrac
08/15	10:25 AM	0.69	2.14	1136.52	milk	98.4	98.3	97.5	97.8	97.9	12	3-E	530	3-E	Curtis
08/17	11:15 AM	0.07		1143.67		20.1	20.5	77.5	27.0	71.7	90	3-E	530	into fallow	Pivotrac
08/17	12:00 PM	1	1	1143.75							92	fallow	530	move dry	Pivotrac
08/17	04:45 PM										180	3		start cw	Pivotrac
08/18	02:45 AM										204	3		stop	Pivotrac
08/18	11:00 AM										204	3		start	Pivotrac
08/20	01:50 AM			1150.89							300	3	530	into 4	Pivotrac
08/20	05:45 PM			1152.46							330	4	530	into 5	Pivotrac
08/21	02:00 PM		1.17	1154.44							360	5	530	into 3-E	Pivotrac
08/22	10:25 AM	0.76		1151.62	dough	98.3	98.2	97.7	97.8	97.8	32	3-E	519	3-E	Curtis
08/23	11:55 PM			1159.81							90	3-E	500	move dry	Pivotrac
08/25	11:30 AM			1165.21							180	3	500	start	Pivotrac
08/27	10:55 PM			1165.31							300	3	500	into 4	Pivotrac Divertment
08/28 08/29	06:45 PM 03:50 PM		1.15	1167.15 1169.10							330 360	4 5	500 500	into 5 into 3-E	Pivotrac Pivotrac
08/29	05:35 AM		1.15	1172.59							90	3-E	500	move dry	Pivotrac
08/31	10:35 AM	0.22		1168.54	dough	98.3	98.2	97.6	97.8	97.9	139	fallow	500	move dry	Curtis
08/31	02:45 PM	0.22		1100.01	uougn	20.5	20.2	27.0	27.0	21.2	180	3		start cw	Pivotrac
09/03	02:20 AM			1178.11							300	3	500	into 4	Pivotrac
09/03	10:30 PM			1179.98							330	4	500	into 5	Pivotrac
09/04	06:55 PM		1.12	1181.87							360	5	500	into 3-E	Pivotrac
09/06	08:00 AM			1185.31							90	3-E	500	move dry	Pivotrac
09/06	12:10 PM										180	3		start cw	Pivotrac
09/08	10:15 AM			1186.48	dough	98.4	98.1	97.0	97.9	98.1	272	3	529	3	Curtis
09/08	11:30 PM			1190.08							300	3	500	into 4	Pivotrac
09/09	07:15 PM			1191.91							330	4	500	into 5	Pivotrac
09/10	03:50 PM		1.13	1193.82							360	5	500	into 3-E	Pivotrac
09/11	02:25 PM										54	3-E		stop	Pivotrac
09/11	02:40 PM			1107.00							54 90	3-E	500	start	Pivotrac
	04:55 AM 09:05 AM			1197.23							90 180	3-E 3	500	move dry start cw	Pivotrac Pivotrac
	12:50 PM			1195.65	dent	98.7	97.8	96.3	98.0	98.3	180	3	541	3	Curtis
	08:05 PM			1202.69	uciti	20.7	27.0	20.5	20.0	20.5	300	3	500	into 4	Pivotrac
	03:35 PM			1202.09							330	4	500	into 4	Pivotrac
	12:35 PM	1	1.15	1206.44			1				360	5	500	into 3-E	Pivotrac
	01:30 AM			1209.86							90	3-E	500	move dry	Pivotrac
09/18	05:40 AM										180	3		start cw	Pivotrac
09/20	02:20 PM	0.15		1214.13	1/4 mat line	98.6	97.4	91.2	97.6	98.2	295	3	530	3	C & L
	04:45 PM			1215.33							300	3	500	into 4	Pivotrac
-	12:40 PM			1217.18							330	4	500	into 5	Pivotrac
	10:25 AM		1.19	1219.19							360	5	500	stop	Pivotrac
09/28				1218.41							0			off	Danny
	01:35 PM	2.30		1218.41		98.0	98.0	98.0	97.6	97.7	1			off	Curtis
	10:30 AM	2.48		1218.41		96.4	98.6	98.6	98.3	98.4	1			off	Curtis
10/18	10:40 AM			1218.41	black layer	98.0	98.2	98.3	98.0	98.1	1			off	Curtis
	10:00 AM 11:25 AM			1218.41	black layer	97.5	98.0	9.3	98.1	98.2	332			off	Curtis
				1218.41	black layer	96.9	97.4	97.7	97.6	97.7	332	move two		off	Curtis
10/31 11/09	08:15 PM 10:50 AM			1218.41	black layer	96.8	97.2	97.6	97.5	97.7	9	move dry		off	Pivotrac Curtis
11/09	10.50 AW			1210.41	harvest	20.0	21.4	27.0	21.5	21.1	,		<u> </u>	011	Danny
	10:25 AM			1218.41	harvested	97.0	97.2	97.5	97.4	97.7			-	off	Curtis
Total		10.48	18.75	1218.45		0.0	0.0	0.0	0.0	0.0	= 0.0	Soil Moisture	533		Leon
	moisture is														
				, and Net	Soil Moistur	e (0.00	in) is T	otal W	ater (29	9.23 in)					
			nted in the											-	

Table 28: 2017 Field Data, "5 GPM" LEPA Corn, 244 bu/ac, Krienke (continued)

Rainfall (10.48 in), Irrigation (18.75 in), and Net Soil Moisture (0.00 in) is Total Water (29.23 in). *Numbers in red are not counted in the total rainfall.

2017 Harvest Results LEPA Corn, Krienke

The 3 GPM-Early field produced a 221 bushel per acre corn yield. Irrigation totaled 18.03 inches. Production in the 3 GPM field was 228 bushels per acre. Seasonal irrigation totaled 13.10 inches. Corn yield was 243 bushels per acre for the 4 GPM field. Irrigation totaled 16.13 inches. Production in the 5 GPM field was 244 bushels per acre. Total irrigation was 18.75 inches. There was no pre-season irrigation.

The 3 GPM-Early field produced 7 less bushels per acre than the 3 GPM field and irrigation was 4.93 inches more. The 4 GPM field produced 15 more bushels per acre than the 3 GPM with 3.03 more inches of irrigation. Production in the 5 GPM field was 16 more bushels per acre than the 3 GPM with 5.65 more inches of irrigation. The 5 GPM yield was 1 more bushel per acre than from 4 the GPM field with 2.62 additional inches of irrigation.

Corn production was 12.25 bushels (686 lb.) per inch of irrigation in the 3 GPM-Early field compared to 17.40 bushels (974 lb.) in the 3 GPM, 15.06 (843 lb.) in the 4 GPM and 13.01 bushels (729 lb.) from the 5 GPM field. Production from each inch of irrigation, rainfall and net soil water that totaled 27.52 inches was 8.03 bushels (450 lb.) per acre in the 3 GPM-Early field. Irrigation, rainfall and net soil water totaled 23.58 inches in the "3 GPM" field where production was 9.67 bushels (541 lb.) per inch. In the 4 GPM field, irrigation, rainfall and net soil water totaled 27.73 inches where production was 8.76 bushels (491 lb.) per inch of total water. Irrigation, rainfall and net soil water totaled 29.23 inches in the 5 GPM field where production was 8.34 bushels (467 lb.) per inch.

Crop production costs were \$37.12 per acre more for the 3-Early GPM field than for the 3 GPM from increased irrigation and seed expenses. At \$3.63 per bushel, the 7 bushels per acre increased corn yield in the 3 GPM field amounts to \$ 24.41 more per acre than from the 3 GPM-Early field. The 3 GPM field's net gain is \$62.53 per acre with 4.93 inches less irrigation used compared to production from the 3 GPM-Early field. At \$3.63 per bushel, the 22 bushel per acre increased yield from the 4 GPM field compared to the 3 GPM-Early amounts to \$79.86. Crop production costs were \$3.88 more for the 3 GPM-Early field. The 4 GPM field's net gain compared to the 3 GPM-Early field is \$83.74 per acre with 1.90 less inches of irrigation. Value of the 23 additional bushels produced in the 5 GPM field compared to the 3 GPM-Early field is \$83.49. Production costs were \$13.34 more for the 5 GPM field than the 3 GPM-Early. Net gain for the 5 GPM field is \$70.15 per acre with 0.72 inches more irrigation.

Net return from the 3 GPM-Early planted field was \$370.72 per acre compared to \$433.25 for the 3 GPM field, \$454.45 per acre for the 4 GPM field, and \$440.87 from the 5 GPM field. Net return from each inch of irrigation was \$20.56 per acre for the 3 GPM-Early field compared to \$33.07 from the 3 GPM field, \$28.17 for the 4 GPM, and \$23.51 for the 5 GPM field. A summary of the demonstration results are shown in Table 29 and Appendix B.

	Irrigation	Total Water	Produ	uction	Gross C	rop Value @	\$3.63/bu
GPM	e		bu/ac	lb/ac-in of	per acre (\$)	Acre-inch	Acre-in of
	(in)	(in)	bu/ac	Irrigation	per acre (\$)	of Irrigation	Total Water
3-E	18.03	27.52 ^a	221	686	802.22	44.49	29.15
3	13.10	23.58 ^b	228	974	827.64	63.18	35.10
4	16.13	27.73 ^c	243	843	882.00	54.68	31.81
5	18.75	29.23 ^d	244	729	885.72	47.23	30.30
^a Includes 0.0	00 inches of s	soil water rem	oved within t	5 feet of soil.	Net water is	rainfall and in	rigation.
^b Includes 0.0	00 inches of s	soil water rem	oved within :	5 feet of soil.	Net water is	rainfall and in	rigation.
CT 1 1 1	10 1 6		1 .1		· · · ·	. 11 1	•



^cIncludes 1.12 inches of net soil water removed within 5 feet of soil, plus rainfall and irrigation.

^dIncludes 0.00 inches of net soil water removed within 5 feet of soil. Net water is rainfall and irrigation.

Harold Grall's 2017 PMDI Irrigation Systems Corn Demonstration 2017 Planting and Crop Information, PMDI Irrigation Systems, Corn, Grall

Harold Grall strip tilled and planted 120 acres of corn in the SW ¼ of section 414 for his "PMDI Irrigation Systems" demonstration. The T-L center pivot was equipped with T-L PMDI drag lines prior to the 2015 growing season. PMDI drag lines were installed 30 inches apart on all spans of the quarter mile center pivot, except span 1 where Senninger LDN LESA applicators remain. The PMDI field was planted to Pioneer P1151AMX hybrid. Seeding rate for the PMDI field was 29,270 seeds per acre. Center pivot tracking was by Pivotrac. Center pivot travel speed was approximately a 7 day circle that applied about 1.00 inch each revolution. Seasonal water meter readings averaged 338 GPM. Periodic, timely rainfall helped provide good in-season soil water levels in producing the crop. Planting and crop information for the "Grall PMDI Irrigation System" demonstration is in Table 30 below.

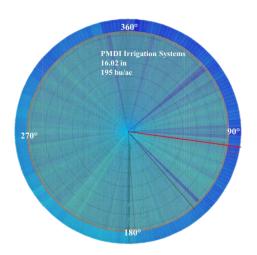
Table 30: 2017 Planting and Crop Information, PMDI Irrigation Systems, Harold Grall

PMDI Irrigation Systems											
Planted	May 30	Harvested	November 4								
Hybrid	Pioneer P1151AMX	Seeding Rate	29,270								
Row Width	30 inches	Tillage	Strip Till								
No. Acres	120.00	GPM/Acre	2.81								
Total Water	28.71 inches	Soil Type	Sherm Silty Clay Loam								
Irrigation	16.02 inches	Insecticide	Capture, Comite								
Herbicide	Verdict, Strut, Roundup	Fertilizer	238-78-0-0								
Herbicide	Balance Flexx, Atrazine	Fungicide	Satori, Aproach								

2017 Irrigation Intensity Map, PMDI Irrigation Systems, Corn, Grall.

Corn was located from 0 to 360 degrees in the circle. Irrigation capacity was 2.81 GPM/acre. Seasonal irrigation totaled 16.02 inches per acre with a yield of 195 bushels per acre. VRI variable rate travel speed control was not available for the 3, 4, 5 GPM Project at this location. Water Intensity Map (courtesy of Pivotrac) was developed for the "3-4-5 GPM" project.

Figure 37: 2017 Irrigation Intensity Map, PMDI Irrigation Systems, Corn, Grall



2017 "PMDI Irrigation Systems" Demonstration Site, Corn, Grall

Rainfall in April and May established a full profile of soil water beginning the season. Soil water was good at 1, 2, 3, 4, and 5 feet at planting. Soil moisture sensors showed the crop had good soil water during the growing season. Weekly gypsum block readings indicated good crop root growth and limited water use from 2 and 3 feet and basically, no water use from 4 and 5 feet producing the crop. Sensors showed the crop used all water stored in the 1 foot root zone plus rainfall in October finishing the crop. Timely, beneficial rainfall in August and October contributed to producing the crop. Rainfall from planting until grain maturity black layer totaled 10.64 inches and was more than normal in August for this location. The crop was produced in Sherm silty clay loam soil that can store approximately 2.00 inches of available water per foot for potential crop use.

Table 31: 2017 Monthly Rainfall Data, PMDI Irrigation Systems, Corn, Grall

GPM	June (in)	July (in)	August (in)	September (in)	October (in)	Total (in)
PMDI	0.25	0.31	8.23	0.46	1.39	10.64

2017 Growing Season Water Tracking, PMDI Irrigation Systems, Corn, Grall

The district tracked total water and crop growth throughout the growing season using rain gauges, water meters, and both gypsum blocks and AquaSpy® soil moisture sensors. One set of five gypsum block soil moisture sensors was installed at 1, 2, 3, 4, and 5 feet, and an AquaSpyTM soil moisture probe was installed down to five feet in the root zone at one location to monitor soil water levels in the "PMDI Irrigation System" demonstration field. Both the gypsum block sensors and the soil probe were installed in close proximity to each other in the field. Gypsum blocks, water meter, rain gauges, and crop growth were read, recorded, and utilized weekly by district personnel. The AquaSpy® probe was installed following crop emergence. A 24/7 Aquaspy probe website showed soil moisture at four inch increments to 48 inches and monitored plant root growth. The website listed all Aquaspy soil probes in the "3-4-5 GPM" project and was available to all cooperators and district personnel. Another 24/7 Pivotrac website tracked each center pivot system and monitored and controlled irrigation. Both the cooperating grower and district "3-4-5 GPM" Project Leader collectively monitored, controlled, and managed irrigation from the Pivotrac website.

Following this paragraph, a series of graphs and tables shows weekly gypsum block readings for the season; growing season water, including rainfall, irrigation, and soil moisture at various growth stages; and the order of irrigation and rainfall events for the T-L PMDI Irrigation System demonstration field. Finally, a form describes the protocols for each field. "Total Water," as shown on the graph for growing season water, is the sum of seasonal irrigation, rainfall, and net soil water

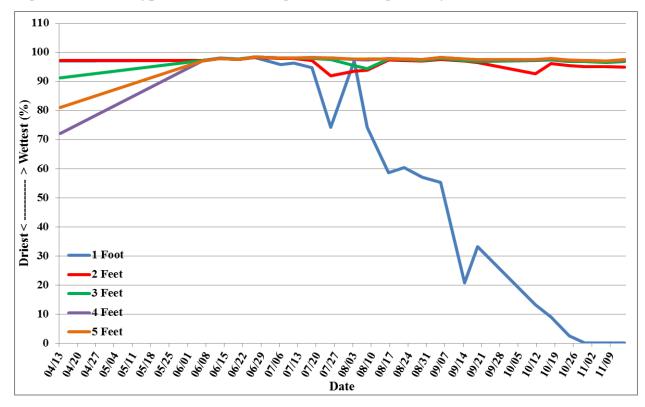
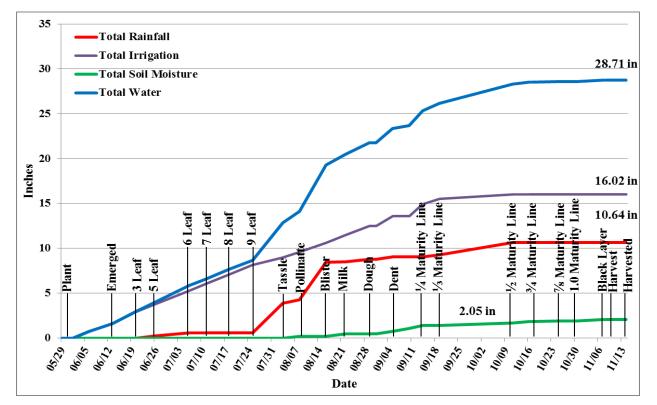


Figure 38: 2017 Gypsum Block Readings, "PMDI Irrigation Systems", 195 bu/ac, Grall

Figure 39: 2017 Growing Season Water Tracking, "PMDI Irrigation Systems", 195 bu/ac, Grall



~		Rainfall	Irrigation	Water	Hour	Growth		So	il Moistu	ire		Pivot	~	Well	Tracking
Date	Time	(inches)	(inches)	Meter	Meter	Stage	1 Foot	2 Feet	3 Feet	4 Feet	5 Feet	Position	Crop Irrigate	(GPM)	Source
04/13	04:20 PM			420733	none		97.1	97.2	91.2	72.2	81.1	169		off	C & L
04/21		1.19													Pivotrac
04/26		0.35													Pivotrac
04/29		1.11													Pivotrac
04/30		0.28													Pivotrac
05/03		0.21													Pivotrac
05/10		0.47													Pivotrac
05/11		0.20													Pivotrac
05/16		0.20													Pivotrac
05/22		0.36													Pivotrac
05/30						plant									Harold
06/01	09:50 AM		start	420733								340	PMDI		Pivotrac
06/06	09:30 AM		0.76	445643			97.3	97.3	97.2	97.1	97.1	182	PMDI	358	Curtis
06/13	09:45 AM		0.85	481659		emerged	98.1	97.9	97.9	97.9	97.9	128	PMDI	345	Curtis
06/20	10:20 AM		1.33	517056		3 leaf	97.7	97.5	97.7	97.6	97.6	95	PMDI	323	Curtis
06/26	04:15 PM	0.25	0.85	544133		5 leaf	98.3	98.2	98.4	98.5	98.5	355	PMDI	315	Curtis
07/06	09:45 AM	0.31	1.48	592549		6 leaf	95.8	97.9	98.1	98.1	98.1	87	PMDI	350	Curtis
07/11	10:10 AM		0.76	617401		7 leaf	96.3	97.9	98.1	98.1	98.1	314	PMDI	329	Curtis
07/18	09:45 AM		1.06	651956		8 leaf	94.8	97.3	98.0	98.2	98.1	275	PMDI	341	Curtis
07/25	11:00 AM		1.03	685450		9 leaf	74.3	92.0	97.6	98.1	98.1	231	PMDI	315	Paul
08/03	09:35 AM	3.32	0.85	712619		tassle	97.1	93.6	95.4	97.6	97.8	88	Off		Curtis
08/08	02:20 PM	0.41	0.62	732944		pollinate	74.3	93.9	94.5	97.4	97.8	348	PMDI	345	Curtis
08/16	01:50 PM	4.14	1.05	767331		blister	58.6	97.4	97.8	97.9	97.8	12	PMDI	345	Curtis
08/22	02:55 PM	0.09	0.85	795033		milk	60.4	97.2	97.6	97.7	97.7	328	PMDI	339	Curtis
08/29	10:20AM	0.27	1.01	828046		dough	57.1	97.0	97.3	97.5	97.5	327	PMDI	317	Curtis
09/05	01:50 PM	0.23	1.08	863295		dent	55.3	97.6	98.0	98.2	98.2	26	PMDI	337	Curtis
09/14	01:40 PM		1.34	906902		1/4 mat line	20.7	97.0	97.3	97.8	97.8	64	PMDI	342	Curtis
09/19	10:35 AM	0.23	0.58	925993		⅓ mat line	33.3	96.5	96.8	97.4	97.5	266	PMDI	371	Curtis
10/11	01:15 PM	1.39	0.52	942819		1/2 mat line	13.3	92.6	97.3	97.4	97.5	65	off		Curtis
10/17	02:10 PM			942819		¾ mat line	9.0	96.1	97.4	97.7	97.9	65	off		Curtis
10/24	02:15 PM			942819		‰ mat line	2.6	95.4	96.9	97.3	97.4	65	off		Curtis
10/30	02:20 PM			942819		1.0 mat line	0.0	95.1	96.9	97.2	97.3	65	off		Curtis
11/07	11:35 AM			942819		black layer	0.0	95.1	96.6	97.0	97.1	163	move dry		Curtis
11/08						harvest									Harold
11/14	12:00 noon			942819		harvested	0.0	94.9	96.9	97.3	97.6	184	move dry		Curtis
Total															
Net soil r	Net soil moisture is 2 05 inches.														
Rainfall (10.64 in), ir	rigation (16	5.02 in), and	d net soil m	oisture (2.0	05 in) is total	water (2	8.71 in).							
*Number	s in red are	not counte	d in the tot	al rainfall.											

Table 32: 2017 Field Data, "PMDI Irrigation Systems", 195 bu/ac, Grall

2017 Harvest Results, PMDI Irrigation Systems, Corn, Grall

T-L PMDI field produced a 195 bushel per acre corn yield; irrigation totaled 16.02 inches per acre. Corn production was 12.17 bushels (681 lb.) from each inch of irrigation. Production from each inch of irrigation, rainfall, and net soil water that totaled 28.71 inches was 6.79 bushels (380 lb.) per acre. Crop production costs were \$384.98 per acre for irrigation, fertilizer, seed, and harvest expenses. At \$3.63 per bushel, the 195 bushels per acre amounted to \$707.85. Net return for the PMDI field was \$322.87 per acre. Net return from each inch of irrigation was \$20.15. Net return from each inch of irrigation, rainfall, and net soil water was \$11.24. There was sufficient available water throughout the growing season to produce the crop. A summary of the T-L PMDI Irrigation System demonstration results are shown in Table 33 and in Appendix A. Results from another PMDI drag line demonstration are located in the Grall 328 PMDI Irrigation Systems section of this report.

	T	Total	Prod	luction	Gros	s Crop Value	@ \$3.63/bu				
GPM	Irrigation (in)	Water	bu/ac		*	Acre-inch of					
	~ /	(in)		Irrigation	(\$)	Irrigation (\$)	Total Water (\$)				
PMDI	16.02	28.71	195	681	\$707.85	\$44.18	\$24.65				
Includes 2.05 inches of soil water removed within 5 feet of the plant root zone.											

Table 33: 2017 PMDI Irrigation Systems Demonstration Results, Corn, Grall

Stan Spain's 2017 Moore County SDI "3-4-5 GPM" Cotton Demonstration



2017 Planting and Crop Information, SDI Cotton, Spain

Stan Spain strip tilled and planted 18.75 acres of cotton in the south half of section 47 for the "3-4-5 GPM" SDI cotton demonstration. The SDI acres were positioned between two LEPA center pivot irrigation systems at the District's WCC. There are 16 irrigation zones in the SDI system divided in the north and south by a field road. Cotton was planted in the south acres of the SDI irrigation system. Each south zone was

2.345 acres. Zone 11 was Spain's 3 GPM field, zone 12 was the 4 GPM field, and zone 13 was the 5 GPM field. Three irrigation plans were developed and run by Field Net to apply the project's weekly irrigation amounts. Each plan irrigated two zones simultaneously three times each week. The irrigation plan applied 0.38 inches each 56 hour cycle to apply 1.14 inches per week for the 3 GPM field, 0.50 inches each cycle to apply 1.50 inches for the 4 GPM field, and 0.62 inches to apply 1.86 inches for the 5 GPM field. The north 19.44 SDI acres were planted to corn and irrigated in sequence with the south cotton acres. Spain planted each "3, 4, 5 GPM" field to Dynagro DG3385B2XF cotton variety. Seeding rate was 55,000 seeds per acre for the 3 GPM, 4 GPM, and 5 GPM acres. Seasonal water meter readings averaged 148 GPM (2.00-2.345 acre zones). Irrigation was with Netafim 13 mil Typhoon series SDI tape laterals spaced 30 inches apart with 0.18 GPH TurbONet emitters spaced 24 inches. Planting and crop information for "Spain 3 GPM", "Spain 4 GPM", and "Spain 5 GPM" SDI cotton are shown in Table 33 below.

3 GPM Demonstration Site: SDI Zone 11												
Planted	May 17	Harvested	December 13									
Hybrid	Dynagro DG3385B2XF	Seeding Rate	55,000									
Row Width	30 inches	Tillage	Strip Till									
No. Acres	2.345	GPM per acre	3.00									
Total Water	23.13 inches	Soil Type	Sherman Clay Silty Loam									
Irrigation	6.42 inches	Insecticide	Acephate									
4 GPM Demons	tration Site: SDI Zone 12											
Planted	May 17	Harvested	December 13									
Hybrid	Dynagro DG3385B2XF	Seeding Rate	55,000									
Row Width	30 inches	Tillage	Strip Till									
No. Acres	2.345	GPM per acre	4.00									
Total Water	22.27 inches	Soil Type	Sherman Clay Silty Loam									
Irrigation	7.50 inches	Insecticide	Acephate									

Table 34: 2017 Planting and Crop Information, SDI Cotton, Stan Spain

5 GPM Demonstration Site: SDI Zone 13											
Planted	May 17	Harvested	December 13								
Hybrid	Dynagro DG3385B2XF	Seeding Rate	55,000								
Row Width	30 inches	Tillage	Strip Till								
No. Acres	2.345	GPM per acre	5.00								
Total Water	23.65 inches	Soil Type	Sherman Clay Silty Loam								
Irrigation	8.58 inches	Insecticide	Acephate								

 Table 34: 2017 Planting and Crop Information, SDI Cotton, Stan Spain (continued)

2017 Soil Water Profile and Growing Season Rainfall "3 GPM" SDI Cotton Demonstration Site

Preseason soil water was good at 1, 2, 3, 4, and 5 feet and at planting. Weekly gypsum block readings indicated the crop used more water than irrigation and rainfall provided by week three in July at the bloom growth stage using 95% of that stored at 1 foot. The crop used all water stored at 1, 2, and 3 feet during September plus irrigation and rainfall. Rainfall in September refilled the profile at 1, 2, and 3 feet, but did not penetrate to 4 and 5 feet. Plant roots developed into 4 and 5 feet in October using about 60% of that stored at 4 feet and 25% from 5 feet, additional amounts from 1, 2, and 3 feet plus rainfall. The sensors showed 3.54 inches of soil water were used from 1, 2, 3, 4, and 5 feet in the root zone during September and October finishing the crop. Sensors indicated the crop had adequate soil water during the growing season. The crop was produced in Sherm silty clay loam that can store approximately 2.00 inches of available water per foot for potential crop use. Rainfall from planting until plant termination totaled 13.17 inches.

"4 GPM" SDI Demonstration Site

Soil water was good at 1, 2, 3, 4, and 5 feet at planting from preseason rainfall. Soil moisture sensors showed plant roots began using water from 1, 2, and 3 feet in the root zone at the bloom growth stage in late-August in addition to irrigation and rainfall. All soil water stored at 1, 2, and 3 feet was used by mid- September. September rainfall refilled the soil profile at 1 and 2 feet to beginning levels but only partially at 3 feet. Sensors showed no soil water was used from 4 and 5 feet producing the crop, which is significantly different from soil water use in the 3 GPM field. Weekly gypsum block readings showed the crop had adequate soil moisture during the growing season. Sensors showed 2.20 inches of net soil water was used. A total of 13.17 inches of rainfall was recorded from planting through harvest. Soil was Sherm silty clay loam that holds approximately 2.00 inches available water per foot for potential crop use.

"5 GPM" SDI Demonstration Site

Beginning soil water was good at 1, 2, 3, 4, and 5 feet at planting from preseason rainfall. Soil moisture sensors showed plant roots removed water from 1 foot the third week in July at the bloom growth stage in addition to irrigation and rainfall. Plants used about 85% of the water stored at 1 foot that was soon refilled by irrigation and rainfall. Plants used all water stored at 1, 2, and 3 feet in late August and September plus irrigation and rainfall. Rainfall in October refilled the soil profile to the levels at

planting. Weekly gypsum block moisture sensor readings show the crop had sufficient available soil water during the entire growing season. Sensors showed plants removed 1.90 inches of net soil water from 1, 2, 3, and 4 feet during October and November finishing the crop. Rainfall totaled 13.17 inches from planting through plant termination. Cotton was produced in Sherm silty clay loam soil that holds 2.00 inches of available water per foot for potential crop use.

Table 35: 2017 Monthly Rainfall Data, SDI Cotton, Spain

GPM	May (in)	June (in)	July (in)	August (in)	September (in)	October (in)	Total (in)
3, 4, 5	0.38	1.86	0.54	6.54	2.77	1.08	13.17

2017 Growing Season Water Tracking, SDI Cotton, Spain

The district tracked total water and crop growth throughout the growing season using rain gauges, water meters, and both gypsum blocks and AquaSpy® soil moisture sensors. One set of five gypsum block soil moisture sensors was installed at 1, 2, 3, 4, and 5 feet, and an AquaSpyTM soil moisture probe was installed down to four feet in the root zone at one location to monitor soil water levels in the "3 GPM" field. Another set of the same type of sensors were installed in each "4 GPM" and "5 GPM" field. Both the gypsum block sensors and the soil probe were installed in close proximity to each other in each field. Gypsum blocks, water meters, rain gauges, and crop growth were read, recorded, and utilized weekly by district personnel. Each AquaSpy® probe was installed following crop emergence. A 24/7 Aquaspy probe website showed soil moisture at four inch increments to 48 inches and monitored plant root growth as well as soil moisture levels. The website listed all Aquaspy soil probes in the"3, 4, 5, GPM" project and was available to all cooperators and district personnel. Another 24/7 Pivotrac website tracked each center pivot system and monitored and controlled irrigation. The SDI irrigation plans were written to apply 1.14 inches ("3 GPM"), 1.50 inches ("4 GPM"), and 1.86 inches ("5 GPM") and was managed from the Field Net website. The website tracked irrigation by zone being irrigated. Both the cooperating grower and district "3-4-5 GPM" Project Leader collectively monitored, controlled, and managed irrigation from the Field Net website.

Following this paragraph, a series of graphs and tables shows weekly gypsum block readings for the season; growing season water, including rainfall, irrigation, and soil moisture at various growth stages; and the order of irrigation and rainfall events for each "3, 4, 5, GPM" field. "Water Summary," as shown on the graph for growing season water, is the sum of seasonal irrigation, rainfall and net soil water. Graphs and tables for the 3 GPM acres are shown first, followed by the same illustrations for each 4 GPM and 5 GPM.

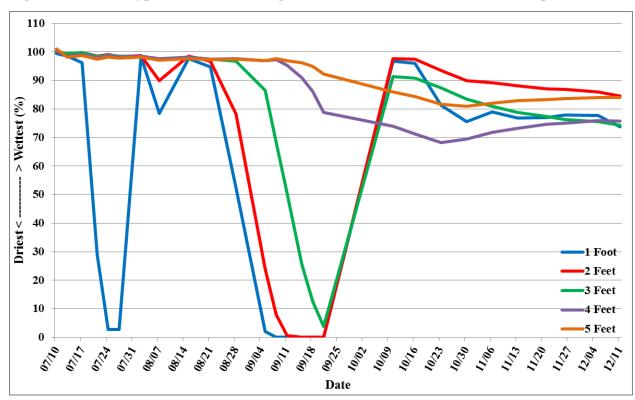
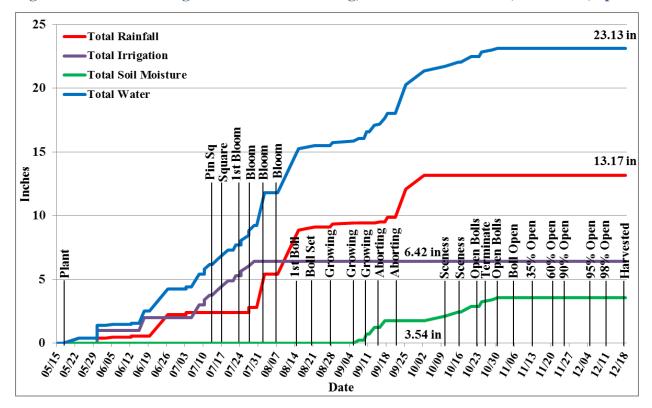


Figure 40: 2017 Gypsum Block Readings, "3 GPM" SDI Cotton, 1189 lb/ac, Spain

Figure 41: 2017 Growing Season Water Tracking, "3 GPM" SDI Cotton, 1189 lb/ac, Spain



Date	Time	Rainfall (inches)	Irrigation (inches)	•	Filter Sta. Meter AF	Field Meter AF	Growth Stage	1 Foot		il Moistu 3 Feet		5 Feet	Zone Irrigating	Filter Sta. Meter GPM	Filter Sta. PSI	Field Meter GPM	Zone Man. PSI	Zone Man. PSI	Trackin Source
03/27		0.33																	Curtis
04/03	10.05 434	2.06			55.50	27.14							- 66						Curtis
4/10	10:05 AM	0.58 0.77			55.59	27.14							off						C & L Curtis
5/01		1.51																	Curtis
05/15		0.48																	Curtis
)5/17							plant												Stan
)5/23		0.38		off									off						Curtis
	03:10 PM 10:05 AM			start cotton	55.59 56.81	27.14 27.14							11,12 13,14	149	14.5	0	14.5	11.0	Stan Curtis
	10:05 AM		0.99	stop	57.14	27.14							9,10	149	14.5	0	14.5	11.0	S & FI
	07:20 AM		0.77	start	57.14	27.14							1,2						S & F
	03:40 PM			stop									7,8						S & FN
	01:55 PM	0.09			58.77	28.77							off						Curtis
	02:30 PM			start	58.77	28.77						-	1,2						S & FN
	02:50 PM	0.07		corn	58.79	28.78							1 & 2		150	14.0	148	12.5	Curtis
	04:25 PM 08:50 AM			stop start	60.33 60.33	30.32 30.32							7,8 11,12						S & FN S & FN
	05:55 PM		0.99	stop	61.88	30.32							9,10						S&F
	10:40 AM				61.88	30.32							off						Curtis
	01:45 PM	1.70			62.09	3032							off						Curtis
)6/28				start	62.11	30.32							1,2						Stan
	02:20 AM			stop	64.60	32.81							7,8						S & F1
	08:00 PM 04:20 PM	0.17		etort	64.60 64.60	32.81 32.81							off 9,10						Curtis S & FN
	04:20 PM 01:20 AM		1.02	start stop	66.20	32.81		1				1	9,10		-				5 & FI
	02:30 AM		2102	Plan 1	66.20	32.81							1,2				l	1	S & FN
	02:30 AM			start	66.20	32.81							1,2						S & F1
07/10	09:45 AM			cotton	67.71	33.60		99.5	99.9	100.2	100.3	101.1	15 & 16	141	15.0	0	14.5	10.5	Curtis
	11:30 AM		0.38	into corn									15,16						FN
	08:35 PM		0.38	into corn		24 70	ani-	00 5	00.2	00.1	09.7	09.2	15,19	150	15.0	150	12.5	11.0	FN
	11:25 AM 05:40 AM		0.38	corn	69.64 70.80	34.78 35.15	pin sq	98.6	99.3	99.4	98.5	98.2	3 & 4 15,16	150	15.0	150	13.5	11.0	Curtis S & Fl
	05:40 AM 05:45 AM		0.30	Plan 2	70.80	35.15							Plan 2					-	5 & FI
	05:45 AM			start	70.80	35.15							1,2						FN
7/17	02:50 PM		0.38	into corn									1,2						S & F1
	03:55 PM			corn	72.49	36.07	square	96.2	99.8	99.8	99.1	98.7	1 & 2	160	16.0	159	15.0	12.5	Curtis
	11:50 PM		0.38	into corn									15,16						S & FI
	10:05 AM		0.00	cotton	75.13	37.82	square	29.0	98.5	98.4	98.0	97.5	9 & 10	153	17.0	0	16.0	12.0	Curtis
	08:50 AM 01:45 PM		0.38	into corn cotton	77.32	38.12	lst bloom	2.8	99.0	98.9	98.7	98.1	15,16 15 & 16	150	16.0	0	16.0	14.0	FN Paul
	06:35 PM		0.38	into corn		36.12	IST DIOOII	2.0	99.0	96.9	96.7	96.1	15 & 16	150	10.0	0	10.0	14.0	Faul
	03:55 AM			into corn									15,16						FN
	02:00 PM	0.37		corn	79.43	39.92	bloom	2.7	98.4	98.5	98.3	97.9	3&6	163	na	160		16.0	Paul
	01:00 PM		0.38	cotton	80.79	40.51							15,16						S & FN
	01:05 PM			Plan 3				-				-	Plan 3						S & FN
	01:05 PM			start	80.79	40.51							1,2						S & FN
	05:40 PM 04:15 PM	2.61		stop	81.66 81.66	41.35 41.35	bloom	98.3	98.7	98.4	98.5	98.1	7,8 off						S & FN Curtis
	09:40 AM	2.01			81.66	41.35	bloom	78.5	98.7 89.9	98.4	98.5	98.1	off						Curtis
	03:45 PM	3.45			81.66	41.35	1st boll	97.7	98.5	98.2	98.2	97.6	off						Curtis
	11:00 AM	0.24			81.66	41.35	boll set	94.8	96.8	97.4	97.5	97.2	off						Curtis
	11:10 AM			Corn	81.66	41.35							Corn						S & FN
	11:10 AM			start	81.66	41.35							1,2						S & FN
	03:40 PM			into 1,2									7,8						FN
	08:10 PM 12:40 AM			into 1,2 stop	84.19	43.85							7,8 7,8						FN S&FN
	12:05 PM	0.24		stop	84.19	43.85	growing	52.4	78.2	96.8	97.6	97.5	off						Curtis
	11:30 AM	0.11			84.19	43.85	growing	2.1	23.9	86.6	96.9	97.0	off						Curtis
9/07	09:20 AM			start	84.19	43.85							1,2						S & FI
	01:50 PM			into 1,2			growing						7,8						S & FI
7,00	03:30 PM			corn	85.07	44.73	growing	0.0	7.9	68.4	97.3	97.7	1 & 2	155	15.0	155	14.0	12.0	Curtis
	06:20 PM 10:45 PM			into 1,2	86.67	46.31							7,8 7,8						S & FI S & FI
	11:35 AM			stop	86.67	46.31	growing	0.0	0.5	50.5	95.3	96.9	7,8 off					<u> </u>	Curtis
	02:40 PM	0.08			86.67	46.31	aborting	0.0	0.0	25.7	91.0	96.2	off						Curtis
	03:05 PM	0.34			86.67	46.31	aborting	0.0	0.0	12.6	86.1	94.9	off						Curtis
	10:40 AM			start	86.67	46.31							1,2						S & FI
	03:10 PM			into 1,2			ļ						7,8						S & FI
	11:00 AM			corn	88.10	47.74	aborting	0.0	0.0	3.9	78.8	92.2	4 & 5	157	16.0	155	15.0	12.0	Curtis
	07:40 PM	2.24		stop	88.35	47.97 47.97							7,8						S & FI
	10:40 AM 10:25 AM	2.24			88.35 88.35	47.97							off off						Curtis Curtis
	04:00 PM	1.00			88.35	47.97	sceness	96.8	97.7	91.4	73.9	86.0	off					1	Curtis
	03:10 PM				88.35	47.97	sceness	96.0	97.5	90.9	71.3	84.3	off					1	Curtis
0/23	03:10 PM				88.35	47.97	open bolk	81.3	93.6	87.4	68.2	81.6	off						Curtis
0/24	-						terminate												Stan
	11:45 AM				88.35		open boll		89.9	83.4	69.5	80.9	off					<u> </u>	Curtis
	10:50 AM	0.00			88.35		boll open		89.3	80.9	71.9	82.1	off						Curtis
	01:45 PM 09:45 AM	0.08			88.35		35% oper	76.9 77.0	88.1	78.8 77.3	73.2	82.9	off					+	Curtis
	09:45 AM 01:50 PM				88.35 88.35		50% oper 90% oper		87.1 86.9	76.3	74.6 75.0	83.3 83.6	off off						Curtis
	10:50 AM				88.35		90% oper 95% oper	77.7	85.9	75.5	75.9	84.0	off					<u> </u>	Curtis
	11:15 AM				88.35		98% oper	73.7	84.6	74.3	75.8	84.0	off					<u> </u>	Curtis
							harvest												Stan
2/13					88.35	47.97	harvested						off						Curtis
2/13 2/18	02:45 PM						1	0.00	0.00				0 5 4 11	0.1116.1.1					
2/13 2/18 Fotal	02:45 PM I moisture i	13.17	6.42					0.80	0.60	0.79	0.76	0.59	= 3.54"	Soil Moisture					Leon

Table 36: 2017 Field Data, "3 GPM" SDI Cotton, 1189 lb/ac, Spain

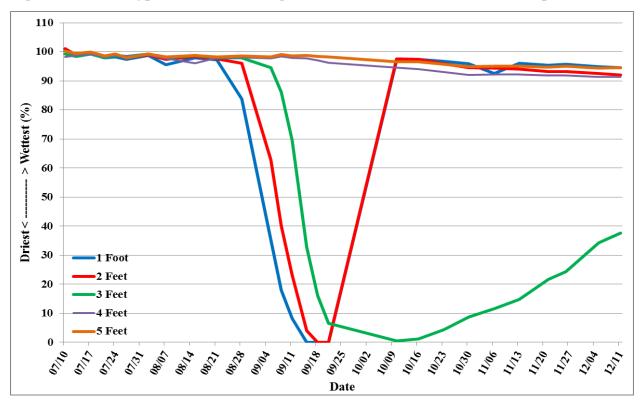
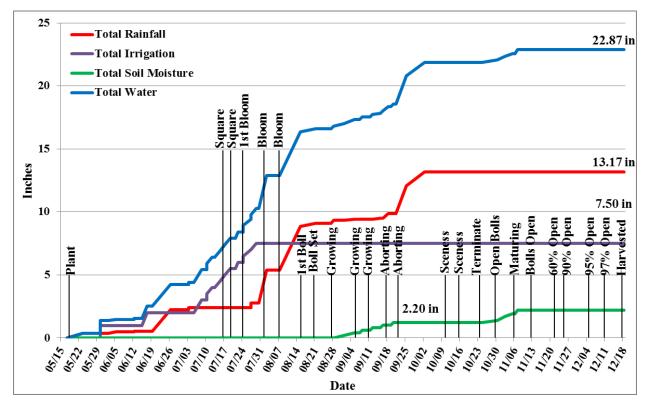


Figure 42: 2017 Gypsum Block Readings, "4 GPM" SDI Cotton, 1186 lb/ac, Spain

Figure 43: 2017 Growing Season Water Tracking, "4 GPM" SDI Cotton, 1186 lb/ac, Spain



Date	Time		Irrigation	Crop	Filter Sta.	Field	Growth			il Moist		6 P - 1	Zone	Filter Sta.		Field Meter	Zone	Zone	Tracking
03/27		(inches) 0.33	(inches)	Irrigate	Meter AF	Meter AF	Stage	1 Foot	2 Feet	3 Feet	4 Feet	5 Feet	Irrigating	Meter GPM	PSI	GPM	Man. PSI	Man. PSI	Source Curtis
04/03	10.05 114	2.06		<u>cc</u>	55.50	07.14							<i>cc</i>						Curtis
04/10 04/24	10:05 AM	0.58 0.77		off	55.59	27.14							off						C & L Curtis
05/01		1.51																	Curtis
05/15		0.48																	Curtis
05/17 05/23		0.38		off			plant						off						Stan Curtis
05/28	03:10 PM			start	55.59	27.14							11,12						Stan
	10:05 AM 10:05 PM		0.99	cotton	56.81 57.14	27.14 27.14							13,14 9,10	149	14.5	0	14.5	11.0	Curtis S & FN
	07:20 AM		0.99	stop start	57.14	27.14							1,2						S & FN
	03:40 PM			stop									7,8						S & FN
	01:55 PM 02:30 PM	0.09		start	58.77 58.77	28.77 28.77							off 1,2						Curtis S & FN
06/12	02:50 PM	0.07		corn	58.79	28.78							1 & 2		150	14.0	148	12.5	Curtis
	04:25 PM			stop	60.33	30.32							7,8						S & FN
	08:50 AM 05:55 PM		0.99	start stop	60.33 61.88	30.32 30.32							11,12 9,10						S & FN S & FN
	10:40 AM		0.77	stop	61.88	30.32							off						Curtis
	01:45 PM	1.70			62.09	3032							off						Curtis
06/28 07/03	02:20 AM			start stop	62.11 64.60	30.32 32.81							1,2 7,8						Stan S & FN
	08:00 PM	0.17		stop	64.60	32.81							off						Curtis
	04:20 PM		1.02	start	64.60	32.81							9,10					L	S & FN
	01:20 AM 02:30 AM		1.02	stop Plan 1	66.20 66.20	32.81 32.81							15,16 1,2						S & FN S & FN
07/08	02:30 AM			start	66.20	32.81							1,2						S & FN
	09:45 AM		0.50	cotton	67.71	33.60		100.9	101.1	99.2	98.2	100.3	15 & 16	141	15.0	0	14.5	10.5	Curtis
	11:30 AM 08:35 PM		0.50	stop into corn									15,16 15,19						FN FN
07/13	11:25 AM			corn	69.64	34.78		98.5	98.9	98.5	98.8	99.4	3 & 4	150	15.0	150	13.5	11.0	Curtis
	05:40 AM		0.50		70.80	35.15							15,16						S & FN
	05:45 AM 05:45 AM			Plan 2 start	70.80 70.80	35.15 35.15							Plan 2 1,2						S & FN FN
07/17	2:50P M		0.50	into corn		55.15							1,2						S & FN
	03:55 PM			corn	72.49	36.07	square	99.3	99.7	99.3	99.3	99.9	1 & 2	160	16.0	159	15.0	12.5	Curtis
	11:50 PM 10:05 AM		0.50	into corn cotton	75.13	37.82	square	97.9	98.4	98.1	98.2	98.6	15,16 9 & 10	153	17.0	0	16.0	12.0	S & FN Curtis
	08:50 AM		0.50	into corn		57.62	square	71.7	70.4	70.1	70.2	70.0	15,16	155	17.0	0	10.0	12.0	FN
	01:45 PM			cotton	77.32	38.12	lst bloom	98.2	98.9	98.8	98.8	99.2	15 & 16	150	16.0	0	16.0	14.0	Paul
	06:35 PM 03:55 AM		0.50	into corn into corn									15,16 15,16						FN FN
	02:00 PM	0.37	0.50	corn	79.43	39.92	bloom	97.5	98.2	98.5	98.6	98.0	3 & 6	163	na	160		16.0	Paul
07/29	01:00 PM		0.50	cotton	80.79	40.51							15,16						FN
	01:05 PM 01:05 PM			Plan 3 start	80.79	40.51							Plan 3 1,2						S & FN S & FN
	05:40 PM			stop	81.66	41.35							7,8						S & FN
	04:15 PM	2.61			81.66	41.35	bloom	98.8	98.9	99.2	99.0	99.3	off						Curtis
	09:40 AM 03:45 PM	3.45			81.66 81.66	41.35 41.35	bloom 1st boll	95.5 98.0	97.5 98.4	98.0 98.7	97.8 96.1	98.2 98.8	off off						Curtis Curtis
	11:00 AM	0.24			81.66	41.35	boll set	97.3	97.6	97.9	97.9	98.3	off						Curtis
	11:10 AM			Corn	81.66	41.35							Corn						S & FN
	11:10 AM 03:40 PM			start into 1,2	81.66	41.35							1,2 7,8						S & FN FN
	08:10 PM			into 1,2									7,8						FN
08/27	12:40 AM			stop	84.19	43.85							7,8						S & FN
	12:05 PM 11:30 AM	0.24 0.11			84.19 84.19	43.85 43.85	growing growing	83.8 35.3	96.1 62.8	98.0 94.6	98.1 97.7	98.6 98.3	off off						Curtis Curtis
	09:20 AM	0.11		start	84.19	43.85	growing	33.5	02.8	94.0	91.1	20.5	1,2						S & FN
	01:50 PM			into 1,2									7,8						S & FN
	03:30 PM 06:20 PM			corn into 1,2	85.07	44.73	growing	18.0	40.1	86.1	98.4	99.1	1 & 2 7,8	155	15.0	155	14.0	12.0	Curtis S & FN
	10:45 PM			stop	86.67	46.31							7,8						5 & FN 5 & FN
	11:35 AM	0.01			86.67	46.31	growing	8.3	23.1	69.6	97.9	98.6	off						Curtis
	02:40 PM 03:05 PM	0.08			86.67 86.67	46.31 46.31	aborting aborting	0.0	4.0	32.8 16.2	97.8 97.1	98.8 98.5	off off					<u> </u>	Curtis Curtis
	10:40AM	0.04		start	86.67	46.31	aconing	0.0	0.0	10.2	27.1	20.5	1,2						S & FN
09/20	03:10 PM			into 1,2							0.5	0.2	7,8						S & FN
	11:00 AM 07:40 PM			corn stop	88.10 88.35	47.74 47.97	aborting	0.0	0.0	6.5	96.3	98.2	4 & 5 7,8	157	16.0	155	15.0	12.0	Curtis S & FN
	10:40 PM	2.24		stop	88.35	47.97							off						Curtis
10/02	10:25 AM				88.35	47.97						-	off						Curtis
	04:00 PM 03:10 PM				88.35 88.35	47.97 37.97	sceness sceness	97.1 97.4	97.6 97.5	0.5	94.6 94.0	96.6 96.6	off off						Curtis Curtis
	03:10 PM				88.35	47.97	sceness	97.4	97.5	4.4	94.0	95.8	off						Curtis
10/24							terminate												Stan
	11:45 AM 10:50 AM				88.35 88.35	47.97 47.97	open bolls maturing	95.9 92.6	94.5 94.4	8.8 11.5	92.1 92.2	94.9 95.0	off						Curtis Curtis
	01:45 PM	0.08			88.35	47.97	polls oper	92.6 96.0	94.4 94.0	11.5	92.2	95.0 95.1	off					L	Curtis
11/21	09:45 AM				88.35	47.97	60% open	95.4	93.3	21.7	91.8	94.8	off						Curtis
	01:50 PM 10:50 AM				88.35 88.35	47.97 47.97	90% open	95.7 94.9	93.3 92.6	24.4 34.2	91.9 91.3	95.0 94.4	off						Curtis Curtis
	10:50 AM 11:15 AM				88.35	47.97	95% open 97% open	94.9	92.6	34.2	91.3 91.3	94.4 94.6	off					<u> </u>	Curtis
12/13							harvest												Stan
	02:45 PM	13.17	7.50		88.35	47.97	harvested	0.2	0.3	1.3	0.3	0.2	off - 2.20"	Soil Moisture					Curtis
Total Net so	il moisture				I	I		0.2	0.5	1.3	0.5	0.2	- 2.20	Son worsture	I	+	I	•	Leon
Rainfa	ll (13.17 in)), irrigatio	n (7.50 in			ure (2.20 in	i) is total v	vater (22	.87 in).									;	
*Num	pers in red	are not co	ounted in t	he total 1	rainfall.														

Table 37: 2017 Field Data, "4 GPM" SDI Cotton, 1186 lb/ac, Spain

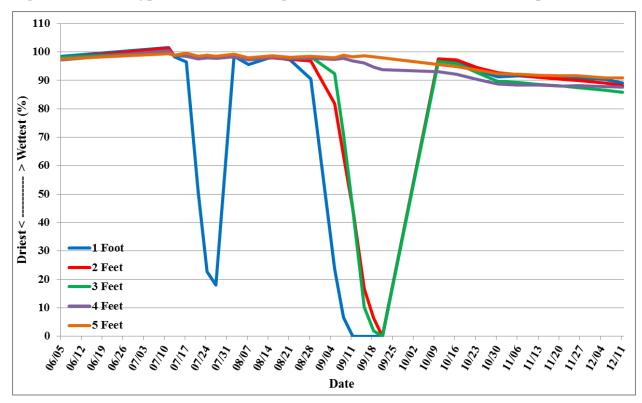
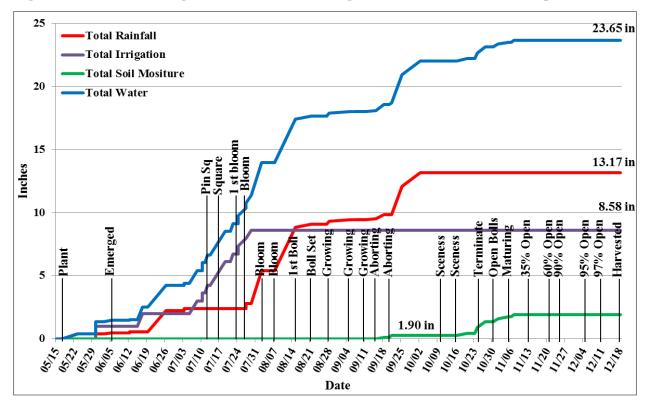


Figure 44: 2017 Gypsum Block Readings, "5 GPM" SDI Cotton, 767 lb/ac, Spain

Figure 45: 2017 Growing Season Water Tracking, "5 GPM" SDI, 767 lb/ac, Spain



											1					
Date	Time	Rainfall	Irrigation	Growth		1	il Moistu			Zone	Filter Sta.	Filter	Field Meter		Zone	Tracking
		(inches)	(inches)	Stage	1 Foot	2 Feet	3 Feet	4 Feet	5 Feet	Irrigating	Meter GPM	Sta. PSI	GPM	Man. PSI	Man. PSI	Source
03/27 04/03		0.33 2.06														Curtis Curtis
04/03	10:05 AM	0.58								off						C & L
04/24	10.05 110	0.77								011						Curtis
05/01		1.51														Curtis
05/15		0.48														Curtis
05/17				plant												Stan
05/23	02.10 PM	0.38								off						Stan
05/28	03:10 PM 07:40 PM									- F F						Curtis
05/29 05/30	10:05 AM									off 13,14	149	14.5	0	14.5	11.0	Curtis Curtis
05/30	10:05 PM		0.99							15,14	149	14.5	0	14.5	11.0	S & FN
05/31	07:20 AM									1,2						S & FN
06/02	03:40 PM									7,8						S & FN
06/05	01:55 PM	0.09		emerged	98.5	97.9	98.1	97.1	97.5	off						Curtis
06/12	02:30 PM															S & FN
06/12	02:50 PM	0.07							-	1 & 2		150	14.0	148	12.5	Curtis
06/14	04:25 PM									7,8						S & FN
06/15 06/17	08:50 AM 05:55 PM		0.99							11,12 9,10						S & FN S & FN
06/17	10:40 AM		0.99							9,10 off						Curtis
06/26	01:45 PM	1.70								off						Curtis
06/28										1,2						Stan
07/03	02:20 AM									7,8						S & FN
07/03	08:00 PM	0.17								off						Curtis
07/05	04:20 PM									9,10				I		S & FN
07/08	01:20 AM		1.02							15,16				ļ		S & FN
07/08	02:30 AM									1,2						S & FN
07/08	02:30 AM 09:45 AM									1,2 15 & 16	141	15.0	0	14.5	10.5	S & FN Curtis
07/10	11:30 AM		0.62							15 & 16	1+1	15.0	U	14.3	10.5	FN
07/10			0.02		101.5	101.3	99.9	100.5	99.3	10,10				1		Curtis
07/12	08:35 PM		0.62							15,19						FN
07/13	11:25 AM			pin sq.	98.2	98.7	98.7	98.8	98.8	3 & 4	150	15.0	150	13.5	11.0	Curtis
07/15	05:40 AM		0.62							15,16						S & FN
07/15	05:45 AM									Plan 2						S & FN
07/15	05:45 AM		0.62							1,2						FN
07/17 07/17	02:50 PM		0.62		96.4	98.7	98.9	98.5	99.6	1,2 1 & 2	160	16.0	159	15.0	12.5	S & FN Curtis
07/19	03:55 PM 11:50 PM		0.62	square	90.4	98.7	98.9	98.5	99.0	15,16	100	16.0	139	13.0	12.3	S & FN
07/21	10:05 AM		0.02	square	50.5	97.6	97.7	97.6	98.4	9 & 10	153	17.0	0	16.0	12.0	Curtis
07/22	08:50 AM		0.62		0.010	~	2.111	2.1.0	2.011	15,16			÷			FN
07/24	01:45 PM			1st bloom	22.8	98.8	98.0	97.9	98.8	15 & 16	150	16.0	0	16.0	14.0	Paul
07/24	06:35 PM		0.62							15,16						FN
07/27	03:55 AM		0.62							15,16						FN
07/27	02:00 PM	0.37	0.62	bloom	18.0	97.8	97.9	97.7	98.5	3&6	163	na	160		16.0	Paul
07/29	01:00 PM 01:05 PM		0.62							15,16 Plan 3						FN S & FN
07/29 07/29	01:05 PM									1,2						5 & FN
07/29	01:05 PM									1,2						S & FN
07/29	05:40 PM									7,8						S & FN
08/02	04:15 PM	2.61		bloom	98.5	98.4	98.5	98.3	99.1	off						Curtis
08/07	09:40 AM			bloom	95.6	97.3	97.4	97.2	97.9	off						Curtis
08/15	03:45 PM	3.45		1st boll	98.2	98.0	98.2	98.1	98.6	off						Curtis
08/21	11:00 AM	0.24		boll set	97.1	97.4	97.8	97.5	98.1	off						Curtis
08/23 08/24	11:10AM 03:40 PM									1,2						S & FN FN
08/24	03:40 PM 08:10 PM									7,8 7,8						FN
08/23	12:40 AM									7,8						S & FN
08/28	12:05 PM	0.24		growing	90.5	96.9	98.2	97.8	98.5	off	1					Curtis
09/05	11:30 AM	0.11		growing	23.7	81.8	92.3	97.3	98.0	off						Curtis
09/07	09:20 AM									1,2						S & FN
09/08	01:50 PM			growing						7,8						S & FN
09/08	03:30 PM			growing	6.7	63.6	71.0	97.8	98.9	1 & 2	155	15.0	155	14.0	12.0	Curtis
09/09	6:20PM 10:45PM									7,8						S & FN
09/10 09/11	10:45PM 11:35 AM			growing	0.0	44.8	44.6	96.9	98.3	7,8 off				l		S & FN Curtis
09/11	02:40 PM	0.08		aborting	0.0	16.7	10.2	96.1	98.6	off				1		Curtis
	03:05 PM	0.34		aborting	0.0	6.5	2.0	94.7	98.3	off						Curtis
09/19										1,2						S & FN
09/20	03:10 PM									7,8						S & FN
09/21	11:00 AM			aborting	0.0	0.0	0.0	93.8	97.9	4 & 5	157	16.0	155	15.0	12.0	Curtis
09/21	07:40 PM	0.01								7,8	I					S & FN
09/25		2.24			ļ					off	l					Curtis
10/02 10/10	10:25 AM 04:00 PM	1.08		scenario	97.4	97.6	96.6	93.0	95.6	off off						Curtis Curtis
10/10	04:00 PM 03:10 PM			sceness sceness	97.4	97.6	96.6	93.0	95.6 94.8	off				l		Curtis
10/23	03:10 PM			sceness	93.4	94.5	92.6	90.4	93.6	off						Curtis
10/24				terminate												Stan
	11:45 AM			open bolls	91.2	92.6	89.6	88.7	92.4	off						Curtis
11/06	10:50 AM			maturing	91.6	92.0	89.3	88.3	92.1	off						Curtis
	01:45 PM	0.08		35% open	91.1	91.1	88.6	88.3	91.8	off				I		Curtis
11/21				60% open	90.7	90.3	87.9	88.0	91.6	off				ļ		Curtis
11/26	01:50 PM			90% open	90.9 90.3	90.0	87.5	88.1	91.6 90.9	off						Curtis
12/05 12/11	10:50 AM 11:15 AM			95% open 97% open	90.3 89.1	89.0 88.2	86.6 85.8	87.8 87.7	90.9	off off				l		Curtis Curtis
12/11	11.15 AW			harvest	07.1	00.2	05.0	07.7	70.7	011						Stan
	02:45 PM			harvested						off						Curtis
Total		13.17	8.58		0.30	0.42	0.50	0.41	0.27	= 1.90"						Leon
	moisture is													-		
				and net soil		e (1.90 ir	i) is total	water (2	23.65 in)			,				
*Numbe	ers in red ar	e not cour	nted in the	total rainfa	П.											

Table 38: 2017 Field Data, "5 GPM", SDI Cotton, 767 lb/ac, Spain

2017 Cotton Harvest Results, SDI, Spain

The 3 GPM field produced 1189 pound per acre cotton yield; irrigation totaled 6.42 inches. Production in the 4 GPM field was 1186 pounds per acre; seasonal irrigation totaled 7.50 inches. Cotton yield was 767 pounds per acre for the 5 GPM field; irrigation totaled 8.58 inches. There was no pre-season irrigation.

The 3 GPM field produced 3 more pounds per acre than the 4 GPM field. Irrigation was 1.08 inches more for the 4 GPM field. The 3 GPM field produced 422 more pounds per acre than the 5 GPM with 2.16 less inches of irrigation. The 4 GPM yield was 419 more pounds per acre than that from 5 GPM field with 1.08 less inches of irrigation.

Cotton production was 185 pounds per inch of irrigation in the 3 GPM field compared to 158 pounds in the 4 GPM and 89 pounds from the 5 GPM field. Production from each inch of irrigation, rainfall, and net soil water that totaled 23.13 inches was 51 pounds per acre in the 3 GPM field. Irrigation, rainfall, and net soil water totaled 22.87 inches in the 4 GPM field where production was 52 pounds per inch. In the 5 GPM field, irrigation, rainfall, and net soil water totaled 23.65 inches where production was 32 pounds per inch of total water.

At \$0.5668 per pound of lint cotton produced, gross value from each inch of irrigation applied was \$104.97 for the 3 GPM field compared to \$89.63 for the 4 GPM and \$50.67 for the 5 GPM field. Gross value of each inch of irrigation, rainfall, and net soil water measured that totaled 23.13 inches in the 3 GPM field was \$29.13. Value of the 22.87 inches of irrigation, rainfall, and net soil water measured in the 4 GPM field was \$29.13. Irrigation, rainfall, and net soil water totaled 23.65 inches in the 5 GPM field for which the gross value was \$18.38. Gross value of cotton produced in the 3 GPM field was \$673.92 per acre compared to \$672.22 for the 4 GPM and \$434.73 for the 5 GPM. A summary of the demonstration results are shown in Table 39 and Appendix K.

	Irrigation	Total	Prod	uction	Gross Crop Value @ \$0.5668/lb					
GPM	Irrigation	Water	lbs	lb/ac-in of	per acre	Acre-in of	Acre-in of Total			
	(in)	(in)	IDS	Irrigation	(\$)	Irrigation (\$)	Water (\$)			
3 GPM	6.42	^a 23.13	1189	185	\$673.92	\$104.97	\$29.13			
4 GPM	7.50	^b 22.87	1186	158	\$672.22	\$89.63	\$29.39			
5 GPM	8.58	^c 23.65	767	89	\$434.74	\$50.67	\$18.38			

^aIncludes 3.54 inches of soil water removed within 5 feet of soil in addition to rainfall and irrigation ^aIncludes 2.20 inches of soil water removed within 5 feet of soil in addition to rainfall and irrigation ^aIncludes 1.90 inches of soil water removed within 5 feet of soil in addition to rainfall and irrigation

2017 Conclusion/Summary "3-4-5 GPM" Demonstrations

Corn production averaged 20.40 bushels (1,142 lb.) per acre inch of irrigation in the 3 GPM field compared to 16.34 bushels (915 lb.) in the 4 GPM field, and 14.38 bushels (805 lb.) per inch in the 5 GPM field. Net return from each inch of irrigation averaged \$39.96 per acre in the 3 GPM field, \$30.73 in the 4 GPM field, and \$26.54 per inch in the 5 GPM field. Irrigation averaged 12.19 inches in the 3 GPM field compared to 15.38 inches in the 4 GPM field, and 17.64 inches in the 5 GPM field. Corn production averaged 244 bushels (13,686 lb.) per acre in the 3 GPM field, 245 bushels (13,703 lb.) in the 4 GPM field, and 249 bushels (13,921 lb.) per acre in the 5 GPM field. Production was 14.38 bushels (889 lb.) per inch of irrigation in the 3 GPM-E field. Net return from each inch was \$20.56. Irrigation was 18.03 inches. Corn production was 221 bushels (12,376 lb.) per acre.

Net return averaged \$477.19 per acre from the 3 GPM field, \$457.67 from the 4 GPM field, and \$454.86 per acre from the 5 GPM field. Net return from the 3 GPM-E field was \$370.72 per acre. Average net return from the additional 3.19 inches of irrigation applied to the 4 GPM fields than the 3 GPM fields was -\$6.12 per inch. Average net return from the additional 5.45 inches of irrigation applied to the 5 GPM fields was (minus) -\$4.10 per inch. Average net return from the additional 2.26 inches of irrigation applied to the 5 GPM fields than the 3 GPM fields was (minus) -\$4.10 per inch. Average net return from the additional 2.26 inches of irrigation applied to the 5 GPM fields with 3.19 inches more irrigation was -\$10.52 per acre. Average net return from the 5 GPM fields where irrigation was 5.45 inches more than the 3 GPM acres was -\$2.33 per acre. Average net return from the 5 GPM fields than the 5 GPM fields than the 4 GPM fields than the 4 GPM acres where irrigation was 2.26 inches more was -\$2.81 per acre.

Irrigation, rainfall, and net soil water averaged 23.95 inches per acre in the 3 GPM field, 27.55 inches in the 4 GPM field, and 29.40 inches for the 5 GPM field. Rainfall averaged 11.76 inches per acre in the 3 GPM field, 11.72 inches in the 4 GPM field, and 11.76 inches in the 5 GPM field. Average net soil water used by the crop was 0.00 inches in the 3 GPM field, 0.45 inches in the 4 GPM field, and 0.00 inches in the 5 GPM field. Average net return from each inch of irrigation, rainfall, and net soil water was \$19.92 for the 3 GPM field, \$16.97 for the 4 GPM field, and \$15.47 for the 5 GPM field. Average net return per bushel of corn produced in the 3 GPM field was \$1.95, \$1.88 in the 4 GPM field, and \$1.84 in the 5 GPM field.

Appendix A is a summary of demonstration corn hybrids, seeding rates, irrigation amounts, and harvest results. **Appendix B** shows corn yield per inch of irrigation applied by all cooperating growers in each "3-4-5 GPM" field. **Appendix C** describes bushels produced from each inch of irrigation for "3-4-5 GPM" fields and by field. **Appendix D** lists net return from each inch of irrigation by field and grower plus water and harvest data for each "3-4-5 GPM" field. **Appendix E** describes net return from each inch of irrigation, rainfall, and soil water for all growers and for all "3- 4-5 GPM" fields. **Appendix F** describes net return per acre for each grower and "3-4-5 GPM" field.

"3-4-5 GPM" 2017 Project

In **Stan Spain's SDI** "3-4-5 GPM" demonstration, irrigation totaled 10.33 inches per acre in the 3 GPM field, 12.49 inches in the 4 GPM field, and 14.65 inches in the 5 GPM field. There was no pre-season irrigation. Net return per acre from each inch of irrigation was \$54.96 for the 3 GPM field compared to \$42.24 for the 4 GPM field and \$34.73 for the 5 GPM field. Irrigation, rainfall, and net soil water totaled 23.86 inches per acre in the 3 GPM field, 26.02 inches in the 4 GPM field, and 28.18 inches in the 5 GPM field. Net return from each inch of total water was \$23.79 for the 3 GPM field, \$20.27 for the 4 GPM field, and \$18.06 for the 5 GPM field. Net return per acre from the 3 GPM field was \$567.59 compared to \$527.54 from the 4 GPM field and \$508.82 from the 5 GPM field.

In **Stan Spain's LEPA** "3-4-5" GPM demonstration, irrigation totaled 11.38 inches per acre in the 3 GPM field, 13.67 inches in the 4 GPM field, and 15.94 inches in the 5 GPM field. There was no preseason irrigation. Net return from each inch of irrigation was \$45.32 for the 3 GPM field compared to \$38.64 for the 4 GPM field, and \$32.25 for the 5 GPM field. Irrigation, rainfall, and net soil water totaled 24.00 inches per acre in the 3 GPM field, 26.29 inches in the 4 GPM field, and 28.56 inches in the 5 GPM field. Net return from each inch of total water was \$21.49 for the 3 GPM field, \$20.09 for the 4 GPM field, and \$18.00 for the 5 GPM field. Net return from the 3 GPM field was \$515.76 per acre compared to \$528.22 from the 4 GPM field and \$514.14 from the 5 GPM field.

For **Harold Grall's LEPA**, irrigation totaled 13.08 inches per acre in the 3 GPM field, 17.84 inches in the 4 GPM field, and 19.44 inches for the 5 GPM field. Pre-season irrigation was 1.13 inches in the 3 GPM field, 2.25 inches in the 4 GPM field, and 2.18 inches in the 5 GPM field. Net return from each inch of irrigation was \$34.76 per acre for the 3 GPM field compared to \$24.43 from the 4 GPM field and \$21.50 for the 5 GPM field. Irrigation, rainfall, and net soil water totaled 24.16 inches per acre in the 3 GPM field, 28.92 inches in the 4 GPM field, and 30.52 inches in the 5 GPM field. Net return from each inch of irrigation, rainfall, and net soil water was \$18.82 per acre for the 3 GPM field, \$15.07 for the 4 GPM field, and \$13.69 per acre for the 5 GPM field. Net return per acre from the 3 GPM field was \$454.70 compared to \$435.85 from the 4 GPM field and \$417.93 from the 5 GPM field.

For **Danny Krienke's LEPA**, irrigation totaled 18.03 inches per acre in the 3 GPM-Early planted field, 13.10 inches for the 3 GPM field, 16.13 inches for the 4 GPM field, and 18.75 inches in the 5 GPM field. There was no pre-season irrigation. Net return from each inch of irrigation was \$20.56 for the 3 GPM-Early planted field compared to \$33.07 from the 3 GPM field, \$28.17 from the 4 GPM field, and \$23.51 for the 5 GPM field. Irrigation, rainfall, and net soil water totaled 27.52 inches for the 3 GPM-Early planted field, 23.58 inches per acre in the 3 GPM field, 27.73 inches in the 4 GPM field, and 29.23 inches of total water for the 5 GPM field. Net return from each inch of total water was \$13.47 for the 3 GPM-Early planted field, \$18.37 for the 3 GPM field, \$16.39 for the 4 GPM, and \$15.08 for the 5 GPM field. Net return from the 3 GPM-Early planted field was \$370.72 per acre and \$433.25 per acre for the 3 GPM field and \$440.87 from the 5 GPM field.

For **Harold Grall's PMDI**, irrigation totaled 13.08 inches per acre in the 3 GPM field, 17.84 inches in the 4 GPM field, and 19.44 inches for the 5 GPM field. Pre-season irrigation was 1.13 inches in the 3 GPM field, 2.25 inches in the 4 GPM field, and 2.18 inches in the 5 GPM field. Net return from each inch of irrigation was \$31.71 per acre for the 3 GPM field compared to \$22.64 from the 4 GPM field, and \$20.13 for the 5 GPM field. Irrigation, rainfall, and net soil water totaled 24.16 inches per acre in the 3 GPM field, 28.92 inches in the 4 GPM field, and 30.52 inches in the 5 GPM field. Net return from each inch of irrigation, rainfall, and net soil water was \$17.16 per acre for the 3 GPM field, \$13.96 for the 4 GPM field, and \$12.82 per acre for the 5 GPM field. Net return from the 3 GPM field was \$414.73 per acre compared to \$403.86 from the 4 GPM field, and \$391.28 from the 5 GPM field.

Irrigation Systems Demonstrations: The NPWD utilized the "3-4-5 GPM" demonstration project to also obtain comparative crop production information from optional improved water application efficiency irrigation systems cooperating growers within the project used. That information supports strategic groundwater management opportunities for ready grower adoption and follows below.

In **Harold Grall's LEPA Shroud versus T-L PMDI drag line irrigation systems demonstration**, irrigation was 13.08 inches in each 3 GPM field, and net return from each inch of irrigation was \$31.71 for the PMDI field compared to \$34.76 for the LEPA field. Irrigation totaled 17.84 inches in both the 4 GPM LEPA and PMDI fields, and net return from each inch of irrigation was \$24.43 for LEPA and \$22.64 for PMDI. In both 5 GPM fields, irrigation totaled 19.44 inches per acre and net return inch was \$21.50 for LEPA and \$20.13 for the PMDI.

Irrigation, rainfall, and net soil water totaled 24.16 inches per acre in the 3 GPM LEPA field and 3 GPM PMDI field. Net return from each inch of total water was \$18.82 for 3 GPM LEPA and \$17.16 for 3 GPM PMDI. Irrigation, rainfall, and net soil water totaled 28.92 inches in the 4 GPM LEPA field and the 4 GPM PMDI field. Net return was \$15.07 from each inch for the 4 GPM LEPA field compared to \$13.96 for PMDI acres. Irrigation, rainfall, and net soil water totaled 30.52 inches in the 5 GPM LEPA field and the 5 GPM PMDI field. Net return was \$13.69 from each inch for the 5 GPM LEPA field compared to \$12.82 for PMDI. In the 3 GPM acres, net return was \$454.70 per acre for LEPA and \$414.73 per acre for PMDI. For the 4 GPM fields, net return was \$435.85 per acre for LEPA and \$403.86 for PMDI. Net return was \$417.93 per acre for the 5 GPM LEPA field and \$391.28 per acre for 5 GPM PMDI.

In **Stan Spain's LEPA versus SDI irrigation systems demonstration**, irrigation was 11.38 inches per acre in the 3 GPM LEPA field and 10.33 inches for the SDI field. Net return from each inch of irrigation was \$45.32 for the LEPA field compared to \$54.96 for the SDI field. Irrigation totaled 13.67 inches for the 4 GPM LEPA field and 12.49 inches for the SDI field. Net return from each inch of irrigation was \$38.64 for LEPA acres and \$42.24 for SDI fields. In the 5 GPM fields, irrigation totaled 15.94 inches for LEPA and 14.65 inches for SDI. Net return was \$32.25 per inch in the 5 GPM LEPA acres and \$34.73 for the SDI fields.

Irrigation, rainfall, and net soil water totaled 24.00 inches per acre in the 3 GPM LEPA field and 23.86 inches in the 3 GPM SDI. Net return from each inch of total water was \$21.49 for LEPA and \$23.79 for

3 GPM SDI. Irrigation, rainfall plus net soil water totaled 26.29 inches in the 4 GPM LEPA field and 26.02 inches in the SDI. Net return was \$20.09 from each inch for the 4 GPM LEPA field compared to \$20.27 for SDI. In the 5 GPM fields, total water was 28.56 inches for the LEPA field and 28.18 inches for the SDI field. Net return from each inch was \$18.00 for LEPA and \$18.06 for SDI. Net return per acre was \$515.76 for the 3 GPM LEPA and \$567.59 for the SDI field. For the 4 GPM fields, net return was \$528.22 per acre for LEPA and \$527.54 for SDI. Net return was \$514.14 per acre for the 5 GPM LEPA field and \$508.82 per acre for 5 GPM SDI.

Summary

The North Plains Groundwater Conservation District's (District) "3-4-5 GPM" project demonstrates how water conservation technologies, irrigation management strategies combined with high efficiency irrigation systems and improved plant genetics can reduce groundwater use and allow agricultural irrigation producers to remain financially viable with both restricted and diminishing groundwater resources.

We learned that retrofit adjustments can be made to existing center pivots, especially in conjunction with current NRCS cost share funding, to significantly improve water application efficiency that gets more of the groundwater pumped to the crop. We also learned that soil health is improved from crop residue, strip or no till management practices. We learned it is easy to over water corn with 4.0 GPM and especially 5.0 GPM per acre when rainfall is more normal and that soil moisture sensors can help manage soil water levels. Also, we learned that drought tolerant hybrids were commonly planted mostly in May and early-June performed well and reduced seasonal irrigation by 2 to 4 inches. 2017 was a challenging corn production year. Growers encountered another growing season in which strategic management practices can lead to additional monetary benefit from available groundwater.

When the **technologies and methods** utilized by the "3-4-5 GPM" demonstrations provide can be translated to three inches of reduced irrigation over the one million acres of corn and other crops in the District, groundwater savings will be 250,000 acre-feet of water per year. This annual water savings can prolong the viability of agriculture irrigation in the area.

"3-4-5 GPM" Project 3-Year Summary

For the three years (2015, 2016, 2017) the "3-4-5 GPM" project was conducted, planting dates averaged May 23 for the 3 GPM and 4 GPM fields, May 22 for the 5 GPM fields, and May 1 for the 3 GPM-Early planted fields. Seeding rates averaged 29,733 seeds per acre for the 3 GPM fields, 30,310 for the 4 GPM fields, 30,733 for the 5 GPM fields, and 30,500 for 3 GPM-Early planted fields. Pre-water application rates averaged 0.49 inches per acre in the 3 GPM fields, 0.57 inches in the 4 GPM fields, 0.63 inches in the 5 GPM fields, and 0.0 inches for the 3 GPM-Early planted fields. Irrigation was 12.61 inches per acre for the 3 GPM fields, 15.28 inches for the 4 GPM fields, 17.36 inches for the 5 GPM fields, and 15.57 inches for the 3 GPM-Early planted fields. Net soil water used by the crop averaged 2.28 inches per acre for the 3 GPM fields, 1.21 inches for the 4 GPM fields, 0.84 inches for the 5 GPM fields, and 2.10 inches for the 3 GPM-Early planted acres. Rainfall was 10.78 inches per acre for the 3 GPM fields, 10.74 inches for the 5 GPM fields, and 11.68 inches for the 3 GPM-

Early planted fields. Irrigation, rainfall, and net soil water averaged 25.66 inches per acre for the 3 GPM fields, 27.39 inches for the 4 GPM fields, 28.94 inches for 5 GPM fields, and 29.34 inches for 3 GPM-Early planted fields. Corn yields averaged 223 bushels per acre for the 3 GPM fields, 232 bushels for the 4 GPM fields, 242 bushels for the 5 GPM fields, and 226 bushels per acre for the 3 GPM-Early planted fields. Corn production averaged 18.17 bushels (1,017 lb.) per acre inch of irrigation in the 3 GPM fields, compared to 15.66 bushels (877 lb.) in the 4 GPM fields, 14.40 bushels (806 lb.) in the 5 GPM fields, and 14.94 bushels (836 lb.) in the 3 GPM-Early planted fields.

Net return from each inch of irrigation averaged \$33.08 per acre in the 3 GPM fields, \$27.66 in the 4 GPM fields, \$25.05 per inch in the 5 GPM fields, and \$25.96 in the 3 GPM-Early planted fields. Net return from each inch of irrigation, rainfall, and net soil water averaged \$16.25 from the 3 GPM fields, \$15.43 from the 4 GPM fields, \$15.03 from the 5 GPM fields, and \$13.78 from the 3 GPM-Early planted fields. Net return per acre averaged \$417.08 from the 3 GPM fields, \$422.59 from the 4 GPM fields, \$434.94 from the 5 GPM fields, and \$404.16 from the 3 GPM-Early planted fields.

Average net return from the additional 2.67 inches of irrigation applied to the 4 GPM fields than the 3 GPM was -\$2.03 per inch. Average net return from the additional 4.75 inches of irrigation applied to the 5 GPM fields than the 3 GPM was -\$1.69 per inch. Average net return from the additional 2.08 inches of irrigation applied to the 5 GPM fields than the 4 GPM was -\$1.25 per inch.

Production costs averaged \$27.16 more per acre for the 4 GPM fields than the 3 GPM. At \$3.63 per bushel, value of the 9 additional bushels produced in the 4 GPM field is \$32.67. Net gain for the 4 GPM field is \$5.51 per acre more than for the 3 GPM fields with 2.67 inches more of irrigation. Production costs averaged \$51.11 per acre more in the 5 GPM fields than the 3 GPM. Value of the additional 19 bushels produced per acre in the 5 GPM field compared to the 3 GPM is \$68.97 per acre. Net gain for the 5 GPM fields is \$17.86 per acre more than from the 3 GPM fields with 4.75 more inches of irrigation. Average production costs were \$23.95 more for the 5 GPM fields than the 4 GPM. At \$3.63 per bushel, value of the additional 10 bushels produced in the 5 GPM fields is \$36.30 per acre. Net gain is \$12.35 per acre more for the 5 GPM field than the 4 GPM fields with 2.08 inches more irrigation.

The crop production costs and net returns are based on 2017 costs as follows: \$6.20 per inch of irrigation, \$3.33 per thousand seeds planted per acre, \$0.36 per bushel harvest expense, nutrient costs provided by Better Harvest, and corn priced at \$3.63 per bushel. 2017 completed the 3-year "3-4-5 GPM" demonstration project.

Appendix G summarizes the 3-year planting dates, seeding rates, irrigation, rainfall, net soil water amounts, and harvest results. **Appendix H** describes 3-year corn yield per inch of irrigation applied by all cooperating growers in each 3-4-5 field. **Appendix I** describes 3-year bushels produced from each inch of irrigation for the 3, 4, 5 fields by field and grower. **Appendix J** shows 3-year bushels produced from each inch of total water by 3, 4, 5 GPM field and grower.

Grower	County	Field	Planting Date	Corn Hybrid	Seeding Rate	Yield (bu/ac)	Total Irrigation (in)	Yield @ bu/ac-in of Irrigation	Acres	Previous Crop	Irrigation by System
		3 GPM	05/31	GA7007	28,000	228	13.10	17.40	80.00	Corn	LEPA
Krienke -	Oshiltara	4 GPM	05/31	GA7007	28,000	243	16.13	15.06	20.00	Corn	LEPA
LEPA	Ochiltree	5 GPM	05/31	GA7007	28,000	244	18.75	13.01	20.00	Corn	LEPA
		3 GPM-Early	05/09	GA4173A	32,000	221	18.03	12.26	60.00	Corn	LEPA
		328 - 3 GPM	05/27	P1151AMX	28,000	221	13.08	16.89	1.69	Corn	PMDI
Grall -	Moore	328 - 4 GPM	05/27	P1151AMX	28,000	228	17.84	12.78	1.69	Corn	PMDI
PMDI	Moore	328 - 5 GPM	05/27	P1151AMX	28,000	227	19.44	11.67	1.69	Corn	PMDI
		414 - 4 GPM	05/30	P1151AMX	29,270	195	16.02	12.17	120.00	Corn	PMDI
		328 - 3 GPM	05/27	P1151AMX	28,000	236	13.08	18.04	79.86	Corn	LEPA
Grall - LEPA	Moore	328 - 4 GPM	05/27	P1151AMX	28,000	240	17.84	13.45	8.00	Corn	LEPA
		328 - 5 GPM	05/27	P1151AMX	28,000	237	19.44	12.19	8.00	Corn	LEPA
		3 GPM	05/24	D58VC53	32,000	277	10.33	26.82	2.43	Corn	SDI
Spain - SDI	Moore	4 GPM	05/24	D58VC53	32,000	267	12.49	21.38	2.43	Corn	SDI
501		5 GPM	05/24	D58VC53	32,000	265	14.65	18.09	2.43	Corn	SDI
		3 GPM	05/24	P1197AMT	32,000	260	11.38	22.85	18.30	Corn	LEPA
Spain -	Moore	4 GPM	05/24	P1197AMT	32,000	270	13.67	19.75	18.30	Corn	LEPA
LEPA	wioore	5 GPM	05/24	P1197AMT	32,000	270	15.94	16.94	18.30	Corn	LEPA
		North - 4 GPM	05/25	P1197AMT	32,000	270	13.64	19.79	55.00	Corn	LEPA

Appendix A: 2017 Corn Hybrids Planted, Seeding Rates, and Irrigation Systems, "3-4-5 GPM" Project

Grower	Field	Planting Date	Pre-Water (in)	Irrigation (in)	Total Irrigation (in)	Rainfall (in)	Total Rainfall & Irrigation (in)	Net Soil Water (in)	Total Water (in)	Corn Yield (bu/ac)	Yield @ bu/ac-in Irrigation	Yield @ bu/ac-In Total Water	Return/Ac	Net Return/Ac-In Irrigation (\$)
Krienke - LEPA	3 GPM	05/31	0.00	13.10	13.10	10.48	23.58	0.00	23.58	228	17.40	9.67	\$433.25	\$33.07
Krienke - LEPA	4 GPM	05/09	0.00	16.13	16.13	10.48	26.61	1.12	27.73	243	15.06	8.76	\$454.45	\$28.17
Krienke - LEPA	5 GPM	05/31	0.00	18.75	18.75	10.48	29.23	0.00	29.23	244	13.01	8.34	\$440.87	\$23.51
Krienke - LEPA	3 GPM-Early	05/31	0.00	18.03	18.03	9.49	27.52	0.00	27.52	221	12.26	8.03	\$370.72	\$20.56
Grall - PMDI	328 - 3 GPM	05/27	1.13	11.95	13.08	11.08	24.16	0.00	24.16	221	16.89	9.15	\$414.72	\$31.71
Grall - PMDI	328 - 4 GPM	05/27	2.25	15.59	17.84	11.08	28.92	0.00	28.92	228	12.78	7.88	\$403.86	\$22.64
Grall - PMDI	414 - 4 GPM	05/27	0.00	16.02	16.02	10.64	26.66	2.05	28.71	195	12.17	6.79	\$322.87	\$20.15
Grall - PMDI	328 - 5 GPM	05/27	2.18	17.26	19.44	11.08	30.52	0.00	30.52	227	11.67	7.43	\$391.28	\$20.12
Grall - LEPA	328 - 3 GPM	05/27	1.13	11.95	13.08	11.08	24.16	0.00	24.16	236	18.04	9.77	\$454.70	\$34.76
Grall - LEPA	328 - 4 GPM	05/27	2.25	15.59	17.84	11.08	28.92	0.00	28.92	240	13.45	8.30	\$435.85	\$24.43
Grall - LEPA	328 - 5 GPM	05/30	2.18	17.26	19.44	11.08	30.52	0.00	30.52	237	12.19	7.76	\$417.97	\$21.50
Spain - SDI	3 GPM	05/25	0.00	10.33	10.33	13.53	23.86	0.00	23.86	277	26.82	11.61	\$567.59	\$54.96
Spain - SDI	4 GPM	05/24	0.00	12.49	12.49	13.53	26.02	0.00	26.02	267	21.38	10.26	\$527.54	\$42.24
Spain - SDI	5 GPM	05/24	0.00	14.65	14.65	13.53	28.18	0.00	28.18	265	18.09	9.40	\$508.82	\$34.73
Spain - LEPA	3 GPM	05/24	0.00	11.38	11.38	12.62	24.00	0.00	24.00	260	22.85	10.83	\$515.76	\$45.32
Spain - LEPA	North - 4 GPM	05/24	0.00	13.64	13.64	12.62	26.26	0.00	26.26	270	19.79	10.28	\$528.22	\$38.64
Spain - LEPA	4 GPM	05/24	0.00	13.67	13.67	12.62	26.29	0.00	26.29	270	19.75	10.27	\$528.22	\$38.64
Spain - LEPA	5 GPM	05/24	0.00	15.94	15.94	12.62	28.56	0.00	28.56	270	16.94	9.45	\$514.14	\$32.25
Average	3 GPM	05/27	0.45	11.74	12.19	11.76	23.95	0.00	23.95	244	20.40	10.21	\$477.19	\$39.96
Average	4 GPM	05/25	0.64	14.73	15.38	11.72	27.55	0.45	27.55	245	16.34	8.94	\$457.67	\$30.73
Average	5 GPM	05/25	0.87	16.77	17.64	11.76	29.40	0.00	29.40	249	14.38	8.48	\$454.86	\$26.54
Average	3 GPM-E	05/09	0.00	18.03	18.03	9.49	27.52	0.00	27.52	221	12.26	8.03	\$370.72	\$20.56

Appendix B: 2017 Summary by Grower, Corn Yield Bushels/Acre-Inch of Irrigation, "3-4-5 GPM" Project

Grower	Field	Planting Date	Pre-Water (in)	Irrigation (in)	Total Irrigation (in)		Total Rain & Irrigation (in)	Net Soil Water (in)	Total Water (in)	Corn Yield (bu/ac)	Yield @ bu/ac-in Irrigation	Yield @ bu/ac-in Total Water	Net Return/Ac @ \$3.63/bu	Net Return/Ac-In Irrigation (\$)
Spain - SDI	3 GPM	05/24	0.00	10.33	10.33	13.53	23.86	0.00	23.86	277	26.82	11.61	\$567.59	\$54.96
Spain - LEPA	3 GPM	05/24	0.00	11.38	11.38	12.62	24.00	0.00	24.00	260	22.85	10.83	\$515.76	\$45.32
Spain - SDI	4 GPM	05/24	0.00	12.49	12.49	13.53	26.02	0.00	26.02	267	21.38	10.26	\$527.54	\$42.24
Spain - LEPA	North - 4 GPM	05/25	0.00	13.64	13.64	12.62	26.26	0.00	26.26	270	19.79	10.28	\$528.22	\$38.64
Spain - LEPA	4 GPM	05/24	0.00	13.67	13.67	12.62	26.29	0.00	26.29	270	19.75	10.27	\$528.22	\$38.64
Spain - SDI	5 GPM	05/24	0.00	14.65	14.65	13.53	28.18	0.00	28.18	265	18.09	9.40	\$508.82	\$34.73
Grall - LEPA	328 - 3 GPM	05/27	1.13	11.95	13.08	11.08	24.16	0.00	24.16	236	18.04	9.77	\$454.70	\$34.76
Krienke - LEPA	3 GPM	05/31	0.00	13.10	13.10	10.48	23.58	0.00	23.58	228	17.40	9.67	\$433.25	\$33.07
Spain - LEPA	5 GPM	05/24	0.00	15.94	15.94	12.62	28.56	0.00	28.56	270	16.94	9.45	\$514.14	\$32.25
Grall - PMDI	328 - 3 GPM	05/27	1.13	11.95	13.08	11.08	24.16	0.00	24.16	221	16.89	9.15	\$414.73	\$31.71
Krienke - LEPA	4 GPM	05/31	0.00	16.13	16.13	10.48	26.61	1.12	27.73	243	15.06	8.76	\$454.45	\$28.17
Grall - LEPA	328 - 4 GPM	05/27	2.25	15.59	17.84	11.08	28.92	0.00	28.92	240	13.45	8.30	\$435.85	\$24.43
Krienke - LEPA	5 GPM	05/31	0.00	18.75	18.75	10.48	29.23	0.00	29.23	244	13.01	8.34	\$440.87	\$23.51
Grall - PMDI	328 - 4 GPM	05/27	2.25	15.59	17.84	11.08	28.92	0.00	28.92	228	12.78	7.88	\$403.86	\$22.64
Krienke - LEPA	3 GPM-Early	05/09	0.00	18.03	18.03	9.49	27.52	0.00	27.52	221	12.26	8.03	\$370.72	\$20.56
Grall - LEPA	328 - 5 GPM	05/27	2.18	17.26	19.44	11.08	30.52	0.00	30.52	237	12.19	7.76	\$417.93	\$21.50
Grall - PMDI	414 - 4 GPM	05/30	0.00	16.02	16.02	10.64	26.66	2.05	28.71	195	12.17	6.79	\$391.28	\$20.12
Grall - PMDI	328 - 5 GPM	05/27	2.18	17.26	19.44	11.08	30.52	0.00	30.52	227	11.67	7.43	\$322.87	\$20.13
Average	3 GPM	05/27	0.45	11.74	12.19	11.76	23.95	0.00	23.95	244	20.40	10.21	\$477.19	\$39.96
Average	4 GPM	05/25	0.64	14.73	15.38	11.72	27.55	0.45	27.55	245	16.34	8.94	\$457.67	\$30.73
Average	5 GPM	05/25	0.87	16.77	17.64	11.76	29.40	0.00	29.40	249	14.38	8.48	\$454.86	\$26.54
Average	3 GPM-E	05/09	0.00	18.03	18.03	9.49	27.52	0.00	27.52	221	12.26	8.03	\$370.72	\$20.56

Appendix C: 2017 Summary by Field, Corn Yield Bushels/Acre-Inch Irrigation, "3-4- 5 GPM" Project

Grower	Field	Planting Date	Pre-Water (in)	Irrigation (in)	Total Irrigation (in)	Rainfall (in)	Total Rainfall & Irrigation (in)	Net Soil Water (in)	Total Water (in)	Corn Yield (bu/ac)	Yield @ bu/ac-in Irrigation	Yield @ bu/ac-In Total Water	Net Return/Ac @ \$3.63/bu	Net Return/ Ac-In Irrigation (\$)
Spain - SDI	3 GPM	05/24	0.00	10.33	10.33	13.53	23.86	0.00	23.86	277	26.82	11.61	\$567.59	\$54.96
Spain - LEPA	3 GPM	05/24	0.00	11.38	11.38	12.62	24.00	0.00	24.00	260	22.85	10.83	\$515.76	\$45.32
Spain - SDI	4 GPM	05/24	0.00	12.49	12.49	13.53	26.02	0.00	26.02	267	21.38	10.26	\$527.54	\$42.24
Spain - LEPA	4 GPM	05/24	0.00	13.67	13.67	12.62	26.29	0.00	26.29	270	19.75	10.27	\$528.22	\$38.64
Spain - LEPA	North - 4 GPM	05/25	0.00	13.64	13.64	12.62	26.26	0.00	26.26	270	19.79	10.28	\$528.22	\$38.64
Grall - LEPA	328 - 3 GPM	05/27	1.13	11.95	13.08	11.08	24.16	0.00	24.16	236	18.04	9.77	\$454.70	\$34.76
Spain - SDI	5 GPM	05/24	0.00	14.65	14.65	13.53	28.18	0.00	28.18	265	18.09	9.40	\$508.82	\$34.73
Krienke - LEPA	3 GPM	05/31	0.00	13.10	13.10	10.48	23.58	0.00	23.58	228	17.40	9.67	\$433.25	\$33.07
Spain - LEPA	5 GPM	05/24	0.00	15.94	15.94	12.62	28.56	0.00	28.56	270	16.94	9.45	\$514.14	\$32.25
Grall - PMDI	328 - 3 GPM	05/27	1.13	11.95	13.08	11.08	24.16	0.00	24.16	221	16.89	9.15	\$414.73	\$31.71
Krienke - LEPA	4 GPM	05/31	0.00	16.13	16.13	10.48	26.61	1.12	27.73	243	15.06	8.76	\$454.45	\$28.17
Grall - LEPA	328 - 4 GPM	05/27	2.25	15.59	17.84	11.08	28.92	0.00	28.92	240	13.45	8.30	\$435.85	\$24.43
Krienke - LEPA	5 GPM	05/31	0.00	18.75	18.75	10.48	29.23	0.00	29.23	244	13.01	8.34	\$440.87	\$23.51
Grall - PMDI	328 - 4 GPM	05/27	2.25	15.59	17.84	11.08	28.92	0.00	28.92	228	12.78	7.88	\$403.86	\$22.64
Grall - LEPA	328 - 5 GPM	05/27	2.18	17.26	19.44	11.08	30.52	0.00	30.52	237	12.19	7.76	\$417.93	\$21.50
Krienke - LEPA	3 GPM-Early	05/09	0.00	18.03	18.03	9.49	27.52	0.00	27.52	221	12.26	8.03	\$370.72	\$20.56
Grall - PMDI	328 - 5 GPM	05/27	2.18	17.26	19.44	11.08	30.52	0.00	30.52	227	11.67	7.43	\$322.87	\$20.13
Grall - PMDI	414 - 4 GPM	05/30	0.00	16.02	16.02	10.64	26.66	2.05	28.71	195	12.17	6.79	\$391.28	\$20.12
Average	3 GPM	05/27	0.45	11.74	12.19	11.76	23.95	0.00	23.95	244	20.40	10.21	\$477.19	\$39.96
Average	4 GPM	05/25	0.64	14.73	15.38	11.72	27.55	0.45	27.55	245	16.34	8.94	\$457.67	\$30.73
Average	5 GPM	05/25	0.87	16.77	17.64	11.76	29.40	0.00	29.40	249	14.38	8.48	\$454.86	\$26.54
Average	3 GPM-E	05/09	0.00	18.03	18.03	9.49	27.52	0.00	27.52	221	12.25	8.03	\$370.72	\$20.56

Appendix D: 2017 Water Summary by Net Return/Acre-Inch Irrigation by Field, "3-4-5 GPM" Project

Grower	Field	Planting Date	Pre-Water (in)	Irrigation (in)	Total Irrigation (in)	Rainfall (in)	Total Rainfall & Irrigation (in)	Net Soil Water (in)	Total Water (in)	Corn Yield (bu/ac)	Yield @ bu/ac-in Irrigation	Yield @ bu/ac-In Total Water	Net Return/Ac @ \$3.63/bu	Net Return/Ac-In Irrigation (\$)	Net Return/ Ac-In Total Water (\$)
Spain - SDI	3 GPM	05/24	0.00	10.33	10.33	13.53	23.86	0.00	23.86	277	26.82	11.61	\$567.59	\$54.96	\$23.79
Spain - LEPA	3 GPM	05/24	0.00	11.38	11.38	12.62	24.00	0.00	24.00	260	22.85	10.83	\$515.76	\$45.32	\$21.49
Spain - SDI	4 GPM	05/24	0.00	12.49	12.49	13.53	26.02	0.00	26.02	267	21.38	10.26	\$527.54	\$42.24	\$20.27
Spain - LEPA	North - 4 GPM	05/25	0.00	13.64	13.64	12.62	26.26	0.00	26.26	270	19.79	10.28	\$528.22	\$38.64	\$20.12
Spain - LEPA	4 GPM	05/24	0.00	13.67	13.67	12.62	26.29	0.00	26.29	270	19.75	10.27	\$528.22	\$38.64	\$20.09
Grall - LEPA	328 - 3 GPM	05/27	1.13	11.95	13.08	11.08	24.16	0.00	24.16	236	18.04	9.77	\$454.70	\$34.76	\$18.82
Krienke - LEPA	3 GPM	05/31	0.00	13.10	13.10	10.48	23.58	0.00	23.58	228	17.40	9.67	\$433.25	\$33.07	\$18.37
Spain - SDI	5 GPM	05/24	0.00	14.65	14.65	13.53	28.18	0.00	28.18	265	18.09	9.40	\$508.82	\$34.73	\$18.06
Spain - LEPA	5 GPM	05/24	0.00	15.94	15.94	12.62	28.56	0.00	28.56	270	16.94	9.45	\$514.14	\$32.25	\$18.00
Grall - PMDI	328 - 3 GPM	05/27	1.13	11.95	13.08	11.08	24.16	0.00	24.16	221	16.89	9.15	\$414.73	\$31.71	\$17.16
Krienke - LEPA	4 GPM	05/31	0.00	16.13	16.13	10.48	26.61	1.12	27.73	243	15.06	8.76	\$454.45	\$28.17	\$16.39
Krienke - LEPA	5 GPM	05/31	0.00	18.75	18.75	10.48	29.23	0.00	29.23	244	13.01	8.34	\$440.87	\$23.51	\$15.08
Grall - LEPA	328 - 4 GPM	05/27	2.25	15.59	17.84	11.08	28.92	0.00	28.92	240	13.45	8.30	\$435.85	\$24.43	\$15.07
Grall - PMDI	328 - 4 GPM	05/27	2.25	15.59	17.84	11.08	28.92	0.00	28.92	228	12.78	7.88	\$403.86	\$22.64	\$13.96
Grall - LEPA	328 - 5 GPM	05/27	2.18	17.26	19.44	11.08	30.52	0.00	30.52	237	12.19	7.76	\$417.93	\$21.50	\$13.69
Krienke - LEPA	3 GPM-Early	05/09	0.00	18.03	18.03	9.49	27.52	0.00	27.52	221	12.26	8.03	\$370.72	\$20.56	\$13.47
Grall - PMDI	328 - 5 GPM	05/27	2.18	17.26	19.44	11.08	30.52	0.00	30.52	227	11.67	7.43	\$322.87	\$20.13	\$12.82
Grall - PMDI	414 - 4 GPM	05/30	0.00	16.02	16.02	10.64	26.66	2.05	28.71	195	12.17	6.79	\$391.28	\$20.12	\$11.24
Average	3 GPM	05/27	0.45	11.74	12.19	11.76	23.95	0.00	23.95	244	20.40	10.21	\$477.19	\$39.96	\$19.92
Average	4 GPM	05/25	0.64	14.73	15.38	11.72	27.55	0.45	27.55	245	16.34	8.94	\$457.67	\$30.73	\$16.97
Average	5 GPM	05/25	0.87	16.77	17.64	11.76	29.40	0.00	29.40	249	14.38	8.48	\$454.86	\$26.54	\$15.47
Average	3 GPM-E	05/09	0.00	18.03	18.03	9.49	27.52	0.00	27.52	221	12.25	8.03	\$370.72	\$20.56	\$13.47

Appendix E: 2017 Water Summary by Net Return/Acre-In of Total Water by Field and by Grower, "3-4-5 GPM" Project

Grower	Field	Planting Date	Pre-Water (in)	Irrigation (in)	Total Irrigation (in)	Rainfall (in)	Total Rainfall & Irrigation (in)	Net Soil Water (in)	Total Water (in)	Corn Yield (bu/ac)	Yield @ bu/ac-in Irrigation	Yield @ bu/ac-In Total Water	Net Return/Ac @ \$3.63/bu	Net Return/Ac-In Irrigation (\$)	Net Return/Ac-In Total Water (\$)
Spain - SDI	3 GPM	05/24	0.00	10.33	10.33	13.53	23.86	0.00	23.86	277	26.82	11.61	\$567.59	\$54.96	\$23.79
Spain - LEPA	North - 4 GPM	05/25	0.00	13.64	13.64	12.62	26.26	0.00	26.26	270	19.79	10.28	\$528.22	\$38.64	\$20.12
Spain - LEPA	4 GPM	05/24	0.00	13.67	13.67	12.62	26.29	0.00	26.29	270	19.75	10.27	\$528.22	\$38.64	\$20.09
Spain - SDI	4 GPM	05/24	0.00	12.49	12.49	13.53	26.02	0.00	26.02	267	21.38	10.26	\$527.54	\$42.24	\$20.27
Spain - LEPA	3 GPM	05/24	0.00	11.38	11.38	12.62	24.00	0.00	24.00	260	22.85	10.83	\$515.76	\$45.32	\$21.49
Spain - LEPA	5 GPM	05/24	0.00	15.94	15.94	12.62	28.56	0.00	28.56	270	16.94	9.45	\$514.14	\$32.25	\$18.00
Spain - SDI	5 GPM	05/24	0.00	14.65	14.65	13.53	28.18	0.00	28.18	265	18.09	9.40	\$508.82	\$34.73	\$18.06
Grall - LEPA	328 - 3 GPM	05/27	1.13	11.95	13.08	11.08	24.16	0.00	24.16	236	18.04	9.77	\$454.70	\$34.76	\$18.82
Krienke - LEPA	4 GPM	05/31	0.00	16.13	16.13	10.48	26.61	1.12	27.73	243	15.06	8.76	\$454.45	\$28.17	\$16.39
Krienke - LEPA	5 GPM	05/31	0.00	18.75	18.75	10.48	29.23	0.00	29.23	244	13.01	8.34	\$440.87	\$23.51	\$15.08
Grall - LEPA	328 - 4 GPM	05/27	2.25	15.59	17.84	11.08	28.92	0.00	28.92	240	13.45	8.30	\$435.85	\$24.43	\$15.07
Krienke - LEPA	3 GPM	05/31	0.00	13.10	13.10	10.48	23.58	0.00	23.58	228	17.40	9.67	\$433.25	\$33.07	\$18.37
Grall - LEPA	328 - 5 GPM	05/27	2.18	17.26	19.44	11.08	30.52	0.00	30.52	237	12.19	7.76	\$417.93	\$21.50	\$13.69
Grall - PMDI	328 - 3 GPM	05/27	1.13	11.95	13.08	11.08	24.16	0.00	24.16	221	16.89	9.15	\$414.73	\$31.71	\$17.16
Grall - PMDI	328 - 4 GPM	05/27	2.25	15.59	17.84	11.08	28.92	0.00	28.92	228	12.78	7.88	\$403.86	\$22.64	\$13.96
Grall - PMDI	414 - 4 GPM	05/30	0.00	16.02	16.02	10.64	26.66	2.05	28.71	195	12.17	6.79	\$391.28	\$20.12	\$11.24
Krienke - LEPA	3 GPM-Early	05/09	0.00	18.03	18.03	9.49	27.52	0.00	27.52	221	12.26	8.03	\$370.72	\$20.56	\$13.47
Grall - PMDI	328 - 5 GPM	05/27	2.18	17.26	19.44	11.08	30.52	0.00	30.52	227	11.67	7.43	\$322.87	\$20.13	\$12.82
Average	3 GPM	05/27	0.45	11.74	12.19	11.76	23.95	0.00	23.95	244	20.40	10.21	\$477.19	\$39.96	\$19.92
Average	4 GPM	05/25	0.64	14.73	15.38	11.72	27.55	0.45	27.55	245	16.34	8.94	\$457.67	\$30.73	\$16.97
Average	5 GPM	05/25	0.87	16.77	17.64	11.76	29.40	0.00	29.40	249	14.38	8.48	\$454.86	\$26.54	\$15.47
Average	3 GPM-E	05/09	0.00	18.03	18.03	9.49	27.52	0.00	27.52	221	12.25	8.03	\$370.72	\$20.56	\$16.39

Appendix F: 2017 Water Summary by Net Return/Acre by Field and Grower, "3-4-5 GPM" Project

Grower	Field	Year	Planting Date	Seeding Rate	Pre-Water (in)	Irrigation (in)	Total Irrigation (in)	Rainfall (in)	Total Rainfall & Irrigation (in)	Net Soil Water (in)	Total Water (in)	Corn Yield (bu/ac)	Yield @ bu/ac-in Irrigation	Yield @ bu/ac-in Total Water
Grall - LESA	3 GPM	2015	05/12	26,000	2.63	11.84	14.47	11.61	26.08	3.97	30.05	222	15.34	7.38
Grall - LEPA	3 GPM	2016	05/25	30,000	0.00	13.57	13.57	8.78	22.35	1.52	23.87	203	14.96	8.50
Grall - LEPA	3 GPM	2017	05/27	28,000	1.13	11.95	13.08	11.08	24.16	0.00	24.16	236	18.04	9.77
Grall - LESA	4 GPM	2015	05/12	26,000	2.63	14.59	17.22	11.61	28.83	1.83	30.66	230	13.35	7.50
Grall - LEPA	4 GPM	2016	05/25	30,000	0.00	14.85	14.85	8.78	23.63	1.84	25.47	191	12.86	7.50
Grall - LEPA	4 GPM	2017	05/27	28,000	2.25	15.59	17.84	11.08	28.92	0.00	28.92	240	13.45	8.30
Grall - LESA	5 GPM	2015	05/12	26,000	2.63	17.20	19.83	11.61	31.44	2.45	33.89	233	11.75	6.87
Grall - LEPA	5 GPM	2016	05/25	30,000	0.00	15.82	15.82	8.78	24.60	1.67	26.27	190	12.01	7.23
Grall - LEPA	5 GPM	2017	05/27	28,000	2.18	19.44	19.44	11.08	30.52	0.00	30.52	237	12.19	7.76
Grall - PMDI	3 GPM	2016	05/25	30,000	0.00	13.57	13.57	8.78	22.35	4.02	26.37	216	15.91	8.19
Grall - PMDI	3 GPM	2017	05/27	28,000	1.13	11.95	13.08	11.08	24.16	0.00	24.16	221	16.89	9.15
Grall - PMDI	4 GPM	2016	05/25	30,000	0.00	14.85	14.85	8.78	23.63	1.93	25.56	200	13.47	7.82
Grall - PMDI	4 GPM	2017	05/27	28,000	2.25	15.59	17.84	11.08	28.92	0.00	28.92	228	12.78	7.88
Grall - PMDI	414 - 4 GPM	2017	05/30	29,270	0.00	16.02	16.02	10.64	26.66	2.05	28.71	195	12.17	6.79
Grall - PMDI	5 GPM	2016	05/25	30,000	0.00	15.82	15.82	8.78	24.60	0.00	24.60	198	12.51	8.05
Grall - PMDI	5 GPM	2017	05/27	28,000	2.18	17.26	19.44	11.08	30.52	0.00	30.52	227	11.67	7.43
Krienke - LEPA	3 GPM-Early	2016	04/25	29,000	0.00	13.11	13.11	13.86	26.97	4.19	31.16	231	17.62	7.41
Krienke - LEPA	3 GPM-Early	2017	05/09	32,000	0.00	18.03	18.03	9.49	27.52	0.00	27.52	221	12.26	8.03
Krienke - LEPA	3 GPM	2015	05/31	26,000	0.00	8.81	8.81	10.77	19.58	3.38	22.96	203	23.04	8.84
Krienke - LEPA	3 GPM	2016	05/30	26,000	0.00	11.07	11.07	12.31	23.36	3.35	26.73	207	18.70	7.74
Krienke - LEPA	3 GPM	2017	05/31	28,000	0.00	13.10	13.10	10.48	23.58	0.00	23.58	228	17.40	9.67
Krienke - LEPA	4 GPM	2015	05/31	27,000	0.00	10.69	10.69	11.79	22.48	2.66	25.14	209	19.55	8.31
Krienke - LEPA	4 GPM	2016	05/30	29,000	0.00	10.80	10.80	11.74	22.54	2.28	24.82	212	19.63	8.54
Krienke - LEPA	4 GPM	2017	05/31	28,000	0.00	16.13	16.13	10.48	26.61	1.12	27.73	243	15.06	8.76
Krienke - LEPA	5 GPM	2015	05/31	28,000	0.00	12.70	12.70	10.77	23.47	2.65	26.12	219	17.24	8.38
Krienke - LEPA	5 GPM	2016	05/30	33,000	0.00	11.07	11.07	11.74	22.81	1.22	24.03	217	19.60	9.03
Krienke - LEPA	5 GPM	2017	05/31	28,000	0.00	18.75	18.75	10.48	29.23	0.00	29.23	244	13.01	8.34

Appendix G: 3-Year Summary (2015, 2016, 2017) Planting Dates, Seeding Rates, Irrigation, Rainfall, Net Soil Water Amounts, and Harvest Results, "3-4-5 GPM" Project

Grower	Field	Year	Planting Date	Seeding Rate	Pre-Water (in)	Irrigation (in)	Total Irrigation (in)	Rainfall (in)	Total Rainfall & Irrigation (in)	Net Soil Water (in)	Total Water (in)	Corn Yield (bu/ac)	Yield @ bu/ac-in Irrigation	Yield @ bu/ac-in Total Water
Spain - LEPA	3 GPM	2015	05/29	32,000	1.31	8.45	9.76	12.77	22.53	3.80	26.33	227	23.26	8.62
Spain - LEPA	3 GPM	2016	05/27	32,000	0.00	14.82	14.82	6.41	21.23	6.35	27.58	195	13.15	7.07
Spain - LEPA	3 GPM	2017	05/24	32,000	0.00	11.38	11.38	12.62	24.00	0.00	24.00	260	22.85	10.83
Spain - LEPA	4 GPM	2015	05/29	32,000	1.31	10.40	11.71	12.77	23.31	2.31	26.79	239	20.41	8.92
Spain - LEPA	4 GPM	2016	05/27	32,000	0.00	18.10	18.10	6.41	24.51	1.31	25.82	217	11.99	8.40
Spain - LEPA	4 GPM	2017	05/24	32,000	0.00	13.67	13.67	12.62	26.29	0.00	26.29	270	19.75	10.27
Spain - LEPA	North-4 GPM	2017	05/24	32,000	0.00	13.64	13.64	12.62	26.26	0.00	26.26	270	19.79	10.28
Spain - LEPA	5 GPM	2015	05/29	32,000	1.31	12.30	13.61	12.77	26.38	0.71	27.09	260	19.10	9.59
Spain - LEPA	5 GPM	2016	05/27	32,000	0.00	18.91	18.91	6.41	25.32	4.20	29.52	260	13.75	8.81
Spain - LEPA	5 GPM	2017	05/24	32,000	0.00	15.94	15.94	12.62	28.56	0.00	28.56	270	16.94	9.45
Spain - SDI	3 GPM	2016	05/27	32,000	0.00	13.76	13.76	7.01	20.77	5.49	26.26	191	13.88	7.27
Spain - SDI	3 GPM	2017	05/24	32,000	0.00	10.33	10.33	13.53	23.86	0.00	23.86	277	26.81	11.61
Spain - SDI	4 GPM	2016	05/27	32,000	0.00	16.46	16.46	7.01	23.47	4.05	27.52	211	12.82	7.66
Spain - SDI	4 GPM	2017	05/24	32,000	0.00	12.49	12.49	13.53	26.02	0.00	26.02	267	21.38	10.26
Spain - SDI	5 GPM	2016	05/27	32,000	0.00	17.44	17.44	7.01	24.45	2.07	26.52	246	14.10	9.27
Spain - SDI	5 GPM	2017	05/24	32,000	0.00	14.65	14.65	13.53	28.18	0.00	28.18	265	18.09	9.40
Yoder - LESA	3 GPM	2015	05/12	32,000	1.22	12.29	13.51	16.60	30.11	-2.04	28.07	251	18.58	8.94
Yoder - LESA	3 GPM	2016	05/14	32,000	0.00	14.84	14.84	7.84	22.68	4.30	26.98	203	13.68	7.52
Yoder - LESA	4 GPM	2015	05/12	32,000	1.22	16.40	17.62	16.60	34.22	-3.50	30.72	276	15.66	8.98
Yoder - LESA	4 GPM	2016	05/14	36,000	0.00	19.90	19.90	7.84	27.74	2.61	30.35	239	12.01	7.87
Yoder - LESA	5 GPM	2015	05/12	32,000	1.22	20.57	21.79	16.60	38.39	-3.52	34.87	307	14.09	8.80
Yoder - LESA	5 GPM	2016	05/14	38,000	0.00	25.19	25.19	7.84	33.03	1.18	34.21	252	10.00	7.36
	3 GPM	1	05/23	29,733	0.49	12.12	12.61	10.78	23.39	2.28	25.66	223	18.17	8.74
Overall 3-4-5	4 GPM	1	05/23	30,310	0.57	14.72	15.28	10.90	26.12	1.21	27.39	232	15.66	8.47
Demonstration Averages	5 GPN	1	05/22	30,733	0.63	16.87	17.36	10.74	28.10	0.84	28.94	242	14.40	8.38
6	3 GPM-E	arly	05/01	30,500	0.00	15.57	15.57	11.68	27.25	2.10	29.34	226	14.94	7.72

Appendix G: 3-Year Summary (2015, 2016, 2017) Planting Dates, Seeding Rates, Irrigation, Rainfall, Net Soil Water Amounts, and Harvest Results, "3-4-5 GPM" Project (continued)

Appendix H: 3-Year Summary (2015, 2016, 2017) Corn Yield/Acre-Inch of Irrigation Applied by all Cooperating Growers, "3-4-5 GPM" Project

Grower	Field	Year	Planting Date	Seeding Rate	Pre-Water (in)	Irrigation (in)	Total Irrigation (in)	Rainfall (in)	Total Rainfall & Irrigation (in)	Net Soil Water (in)	Total Water (in)	Corn Yield (bu/ac)	Yield @ bu/ac-in Irrigation	Yield @ bu/ac-in Total Water
Grall - LEPA	3 GPM	2017	05/27	28,000	1.13	11.95	13.08	11.08	24.16	0.00	24.16	236	18.04	9.77
Grall - LESA	3 GPM	2015	05/12	26,000	2.63	11.84	14.47	11.61	26.08	3.97	30.05	222	15.34	7.38
Grall - LEPA	3 GPM	2016	05/25	30,000	0.00	13.57	13.57	8.78	22.35	1.52	23.87	203	14.96	8.50
Grall - LEPA	4 GPM	2017	05/27	28,000	2.25	15.59	17.84	11.08	28.92	0.00	28.92	240	13.45	8.30
Grall - LESA	4 GPM	2015	05/12	26,000	2.63	14.59	17.22	11.61	28.83	1.83	30.66	230	13.35	7.50
Grall - LEPA	4 GPM	2016	05/25	30,000	0.00	14.85	14.85	8.78	23.63	1.84	25.47	191	12.86	7.50
Grall - LEPA	5 GPM	2017	05/27	28,000	2.18	19.44	19.44	11.08	30.52	0.00	30.52	237	12.19	7.76
Grall - LEPA	5 GPM	2016	05/25	30,000	0.00	15.82	15.82	8.78	24.60	1.67	26.27	190	12.01	7.23
Grall - LESA	5 GPM	2015	05/12	26,000	2.63	17.20	19.83	11.61	31.44	2.45	33.89	233	11.75	6.87
Grall - PMDI	3 GPM	2017	05/27	28,000	1.13	11.95	13.08	11.08	24.16	0.00	24.16	221	16.89	9.15
Grall - PMDI	3 GPM	2016	05/25	30,000	0.00	13.57	13.57	8.78	22.35	4.02	26.37	216	15.91	8.19
Grall - PMDI	4 GPM	2016	05/25	30,000	0.00	14.85	14.85	8.78	23.63	1.93	25.56	200	13.47	7.82
Grall - PMDI	4 GPM	2017	05/27	28,000	2.25	15.59	17.84	11.08	28.92	0.00	28.92	228	12.78	7.88
Grall - PMDI	5 GPM	2016	05/25	30,000	0.00	15.82	15.82	8.78	24.60	0.00	24.60	198	12.51	8.05
Grall - PMDI	414 - 4 GPM	2017	05/30	29,270	0.00	16.02	16.02	10.64	26.66	2.05	28.71	195	12.17	6.79
Grall - PMDI	5 GPM	2017	05/27	28,000	2.18	17.26	19.44	11.08	30.52	0.00	30.52	227	11.67	7.43
Krienke - LEPA	3 GPM	2015	05/31	26,000	0.00	8.81	8.81	10.77	19.58	3.38	22.96	203	23.04	8.84
Krienke - LEPA	4 GPM	2016	05/30	29,000	0.00	10.80	10.80	11.74	22.54	2.28	24.82	212	19.63	8.54
Krienke - LEPA	5 GPM	2016	05/30	33,000	0.00	11.07	11.07	11.74	22.81	1.22	24.03	217	19.60	9.03
Krienke - LEPA	4 GPM	2015	05/31	27,000	0.00	10.69	10.69	11.79	22.48	2.66	25.14	209	19.55	8.31
Krienke - LEPA	3 GPM	2016	05/30	26,000	0.00	11.07	11.07	12.31	23.36	3.35	26.73	207	18.70	7.74
Krienke - LEPA	3 GPM-Early	2016	04/25	29,000	0.00	13.11	13.11	13.86	26.97	4.19	31.16	231	17.62	7.41
Krienke - LEPA	3 GPM	2017	05/31	28,000	0.00	13.10	13.10	10.48	23.58	0.00	23.58	228	17.40	9.67
Krienke - LEPA	5 GPM	2015	05/31	28,000	0.00	12.70	12.70	10.77	23.47	2.65	26.12	219	17.24	8.38
Krienke - LEPA	4 GPM	2017	05/31	28,000	0.00	16.13	16.13	10.48	26.61	1.12	27.73	243	15.06	8.76
Krienke - LEPA	5 GPM	2017	05/31	28,000	0.00	18.75	18.75	10.48	29.23	0.00	29.23	244	13.01	8.34
Krienke - LEPA	3 GPM-Early	2017	05/09	32,000	0.00	18.03	18.03	9.49	27.52	0.00	27.52	221	12.26	8.03

Yield @ Total Total Net Soil Total Corn Yield @ Planting Seeding Pre-Water Irrigation Rainfall Irrigation Rainfall & Water Grower Field Year Water Yield bu/ac-in bu/ac-in Date Rate (in) (in) (in) (in) Irrigation (in) (in) (in) (bu/ac) Irrigation Total Water Spain - LEPA **3 GPM** 2015 05/29 32,000 1.31 8.45 9.76 12.77 22.53 3.80 26.33 227 23.26 8.62 Spain - LEPA 3 GPM 2017 05/24 32,000 0.00 11.38 11.38 12.62 24.00 0.00 24.00 260 22.85 10.83 Spain - LEPA 4 GPM 2015 05/29 32,000 1.31 10.40 11.71 12.77 23.31 2.31 26.79 239 8.92 20.41 Spain - LEPA North-4 GPM 2017 05/2432,000 0.00 13.64 13.64 12.62 26.26 0.00 26.26 270 19.79 10.28 Spain - LEPA 4 GPM 2017 05/24 32,000 0.00 13.67 13.67 12.62 26.29 0.00 26.29 270 19.75 10.27 Spain - LEPA 5 GPM 2015 05/29 32,000 1.31 12.30 13.61 12.77 26.38 0.71 27.09 260 19.10 9.59 Spain - LEPA 5 GPM 2017 05/24 32,000 0.00 15.94 15.94 12.62 28.56 0.00 28.56 270 16.94 9.45 Spain - LEPA 5 GPM 2016 05/2732,000 0.00 18.91 18.91 6.41 25.32 4.20 29.52 260 13.75 8.81 Spain - LEPA 3 GPM 2016 05/2732,000 0.00 14.82 14.82 6.41 21.23 6.35 27.58 195 13.15 7.07 Spain - LEPA 4 GPM 2016 05/2732,000 0.00 18.10 18.10 6.41 24.51 1.31 25.82 217 11.99 8.40 Spain - SDI 3 GPM 2017 05/2432,000 0.00 10.33 10.33 13.53 23.86 0.00 23.86 277 26.81 11.61 4 GPM 2017 05/2432,000 0.00 12.49 12.49 13.53 26.02 26.02 267 Spain - SDI 0.00 21.38 10.26 Spain - SDI 5 GPM 2017 05/2432,000 0.00 14.65 14.65 13.53 28.18 0.00 28.18 265 18.09 9.40 Spain - SDI 5 GPM 2016 05/2732,000 0.00 17.44 17.44 7.01 24.45 2.07 26.52 246 14.10 9.27 3 GPM 2016 05/2732,000 0.00 13.76 13.76 20.77 7.27 Spain - SDI 7.01 5.49 26.26 191 13.88 Spain - SDI 4 GPM 2016 05/2732,000 0.00 16.46 16.46 7.01 23.47 4.05 27.52 211 12.82 7.66 **Yoder - LESA** 3 GPM 2015 05/12 32,000 1.22 12.29 13.51 16.60 30.11 -2.04 28.07 251 18.58 8.94 **Yoder - LESA** 4 GPM 2015 05/1232,000 1.22 16.40 17.62 16.60 34.22 -3.50 30.72 276 15.66 8.98 **Yoder - LESA** 5 GPM 2015 05/12 32,000 1.22 20.57 21.79 16.60 38.39 -3.52 34.87 307 14.09 8.80 **Yoder - LESA** 3 GPM 2016 05/14 32,000 0.00 14.84 14.84 7.84 22.68 4.30 26.98 203 13.68 7.52 **Yoder - LESA** 4 GPM 2016 05/14 36,000 0.00 19.90 19.90 7.84 27.74 2.61 30.35 239 12.01 7.87 **Yoder - LESA** 5 GPM 2016 05/14 38,000 0.00 25.19 25.19 7.84 33.03 1.18 34.21 252 10.00 7.36 3 GPM 05/2329,733 0.49 12.12 12.61 10.78 23.39 2.28 25.66 223 18.17 8.74 **Overall 3-4-5** 4 GPM 05/23 30,310 0.57 14.72 15.28 10.90 26.12 1.21 27.39 232 15.66 8.47 Demonstration 5 GPM 16.87 05/22 30,733 0.63 17.36 10.74 28.10 0.84 28.94 242 14.40 8.38 Averages **3 GPM-Early** 05/01 30,500 0.00 15.57 15.57 11.68 27.25 2.10 29.34 226 14.94 7.72

Appendix H: 3-Year Summary (2015, 2016, 2017) Corn Yield/Acre-Inch of Irrigation Applied by all Cooperating Growers, "3-4-5 GPM" Project (continued)

Grower	Field	Year	Planting Date	Seeding Rate	Pre-Water (in)	Irrigation (in)	Total Irrigation (in)	Rainfall (in)	Total Rainfall & Irrigation (in)	Net Soil Water (in)	Total Water (in)	Corn Yield (bu/ac)	Yield @ bu/ac-in Irrigation	Yield @ bu/ac-in Total Water
Spain - SDI	3 GPM	2017	05/24	32,000	0.00	10.33	10.33	13.53	23.86	0.00	23.86	277	26.81	11.61
Spain - LEPA	3 GPM	2015	05/29	32,000	1.31	8.45	9.76	12.77	22.53	3.80	26.33	227	23.26	8.62
Krienke - LEPA	3 GPM	2015	05/31	26,000	0.00	8.81	8.81	10.77	19.58	3.38	22.96	203	23.04	8.84
Spain - LEPA	3 GPM	2017	05/24	32,000	0.00	11.38	11.38	12.62	24.00	0.00	24.00	260	22.85	10.83
Spain - SDI	4 GPM	2017	05/24	32,000	0.00	12.49	12.49	13.53	26.02	0.00	26.02	267	21.38	10.26
Spain - LEPA	4 GPM	2015	05/29	32,000	1.31	10.40	11.71	12.77	23.31	2.31	26.79	239	20.41	8.92
Spain - LEPA	North-4 GPM	2017	05/24	32,000	0.00	13.64	13.64	12.62	26.26	0.00	26.26	270	19.79	10.28
Spain - LEPA	4 GPM	2017	05/24	32,000	0.00	13.67	13.67	12.62	26.29	0.00	26.29	270	19.75	10.27
Krienke - LEPA	4 GPM	2016	05/30	29,000	0.00	10.80	10.80	11.74	22.54	2.28	24.82	212	19.63	8.54
Krienke - LEPA	5 GPM	2016	05/30	33,000	0.00	11.07	11.07	11.74	22.81	1.22	24.03	217	19.60	9.03
Krienke - LEPA	4 GPM	2015	05/31	27,000	0.00	10.69	10.69	11.79	22.48	2.66	25.14	209	19.55	8.31
Spain - LEPA	5 GPM	2015	05/29	32,000	1.31	12.30	13.61	12.77	26.38	0.71	27.09	260	19.10	9.59
Krienke - LEPA	3 GPM	2016	05/30	26,000	0.00	11.07	11.07	12.31	23.36	3.35	26.73	207	18.70	7.74
Yoder - LESA	3 GPM	2015	05/12	32,000	1.22	12.29	13.51	16.60	30.11	-2.04	28.07	251	18.58	8.94
Spain - SDI	5 GPM	2017	05/24	32,000	0.00	14.65	14.65	13.53	28.18	0.00	28.18	265	18.09	9.40
Grall - LEPA	3 GPM	2017	05/27	28,000	1.13	11.95	13.08	11.08	24.16	0.00	24.16	236	18.04	9.77
Krienke - LEPA	3 GPM-Early	2016	04/25	29,000	0.00	13.11	13.11	13.86	26.97	4.19	31.16	231	17.62	7.41
Krienke - LEPA	3 GPM	2017	05/31	28,000	0.00	13.10	13.10	10.48	23.58	0.00	23.58	228	17.40	9.67
Krienke - LEPA	5 GPM	2015	05/31	28,000	0.00	12.70	12.70	10.77	23.47	2.65	26.12	219	17.24	8.38
Spain - LEPA	5 GPM	2017	05/24	32,000	0.00	15.94	15.94	12.62	28.56	0.00	28.56	270	16.94	9.45
Grall - PMDI	3 GPM	2017	05/27	28,000	1.13	11.95	13.08	11.08	24.16	0.00	24.16	221	16.89	9.15
Grall - PMDI	3 GPM	2016	05/25	30,000	0.00	13.57	13.57	8.78	22.35	4.02	26.37	216	15.91	8.19
Yoder - LESA	4 GPM	2015	05/12	32,000	1.22	16.40	17.62	16.60	34.22	-3.50	30.72	276	15.66	8.98
Grall - LESA	3 GPM	2015	05/12	26,000	2.63	11.84	14.47	11.61	26.08	3.97	30.05	222	15.34	7.38
Krienke - LEPA	4 GPM	2017	05/31	28,000	0.00	16.13	16.13	10.48	26.61	1.12	27.73	243	15.06	8.76
Grall - LEPA	3 GPM	2016	05/25	30,000	0.00	13.57	13.57	8.78	22.35	1.52	23.87	203	14.96	8.50
Spain - SDI	5 GPM	2016	05/27	32,000	0.00	17.44	17.44	7.01	24.45	2.07	26.52	246	14.10	9.27

Appendix I: 3-Year Summary (2015, 2016, 2017) Bushel Yield Produced from Each Inch of Irrigation, "3-4-5 GPM" Project

Grower	Field	Year	Planting Date	Seeding Rate	Pre-Water (in)	Irrigation (in)	Total Irrigation (in)	Rainfall (in)	Total Rainfall & Irrigation (in)	Net Soil Water (in)	Total Water (in)	Corn Yield (bu/ac)	Yield @ bu/ac-in Irrigation	Yield @ bu/ac-in Total Water
Yoder - LESA	5 GPM	2015	05/12	32,000	1.22	20.57	21.79	16.60	38.39	-3.52	34.87	307	14.09	8.80
Spain - SDI	3 GPM	2016	05/27	32,000	0.00	13.76	13.76	7.01	20.77	5.49	26.26	191	13.88	7.27
Spain - LEPA	5 GPM	2016	05/27	32,000	0.00	18.91	18.91	6.41	25.32	4.20	29.52	260	13.75	8.81
Yoder - LESA	3 GPM	2016	05/14	32,000	0.00	14.84	14.84	7.84	22.68	4.30	26.98	203	13.68	7.52
Grall - PMDI	4 GPM	2016	05/25	30,000	0.00	14.85	14.85	8.78	23.63	1.93	25.56	200	13.47	7.82
Grall - LEPA	4 GPM	2017	05/27	28,000	2.25	15.59	17.84	11.08	28.92	0.00	28.92	240	13.45	8.30
Grall - LESA	4 GPM	2015	05/12	26,000	2.63	14.59	17.22	11.61	28.83	1.83	30.66	230	13.35	7.50
Spain - LEPA	3 GPM	2016	05/27	32,000	0.00	14.82	14.82	6.41	21.23	6.35	27.58	195	13.15	7.07
Krienke - LEPA	5 GPM	2017	05/31	28,000	0.00	18.75	18.75	10.48	29.23	0.00	29.23	244	13.01	8.34
Grall - LEPA	4 GPM	2016	05/25	30,000	0.00	14.85	14.85	8.78	23.63	1.84	25.47	191	12.86	7.50
Spain - SDI	4 GPM	2016	05/27	32,000	0.00	16.46	16.46	7.01	23.47	4.05	27.52	211	12.82	7.66
Grall - PMDI	4 GPM	2017	05/27	28,000	2.25	15.59	17.84	11.08	28.92	0.00	28.92	228	12.78	7.88
Grall - PMDI	5 GPM	2016	05/25	30,000	0.00	15.82	15.82	8.78	24.60	0.00	24.60	198	12.51	8.05
Krienke - LEPA	3 GPM-Early	2017	05/09	32,000	0.00	18.03	18.03	9.49	27.52	0.00	27.52	221	12.26	8.03
Grall - LEPA	5 GPM	2017	05/27	28,000	2.18	19.44	19.44	11.08	30.52	0.00	30.52	237	12.19	7.76
Grall - PMDI	414 - 4 GPM	2017	05/30	29,270	0.00	16.02	16.02	10.64	26.66	2.05	28.71	195	12.17	6.79
Grall - LEPA	5 GPM	2016	05/25	30,000	0.00	15.82	15.82	8.78	24.60	1.67	26.27	190	12.01	7.23
Yoder - LESA	4 GPM	2016	05/14	36,000	0.00	19.90	19.90	7.84	27.74	2.61	30.35	239	12.01	7.87
Spain - LEPA	4 GPM	2016	05/27	32,000	0.00	18.10	18.10	6.41	24.51	1.31	25.82	217	11.99	8.40
Grall - LESA	5 GPM	2015	05/12	26,000	2.63	17.20	19.83	11.61	31.44	2.45	33.89	233	11.75	6.87
Grall - PMDI	5 GPM	2017	05/27	28,000	2.18	17.26	19.44	11.08	30.52	0.00	30.52	227	11.67	7.43
Yoder - LESA	5 GPM	2016	05/14	38,000	0.00	25.19	25.19	7.84	33.03	1.18	34.21	252	10.00	7.36
	3 GPM	1	05/23	29,733	0.49	12.12	12.61	10.78	23.39	2.28	25.66	223	18.17	8.74
Overall 3-4-5	4 GPM	1	05/23	30,310	0.57	14.72	15.28	10.90	26.12	1.21	27.39	232	15.66	8.47
Demonstration Averages	5 GPM	1	05/22	30,733	0.63	16.87	17.36	10.74	28.10	0.84	28.94	242	14.40	8.38
	3 GPM-E	arly	05/01	30,500	0.00	15.57	15.57	11.68	27.25	2.10	29.34	226	14.94	7.72

Appendix I: 3-Year Summary (2015, 2016, 2017) Bushel Yield Produced from Each Inch of Irrigation, "3-4-5 GPM" Project (continued)

Net Soil Total Yield @ Total Total Corn Yield @ Planting Seeding Pre-Water Irrigation Rainfall Grower Field Year Irrigation Rainfall & Water Water Yield bu/ac-in bu/ac-in Date Rate (**in**) (in) (in) Irrigation (in) (in) (in) (in) (bu/ac) Irrigation Total Water Spain - SDI 3 GPM 2017 05/2432,000 0.00 10.33 10.33 13.53 23.86 0.00 23.86 277 26.81 11.61 Spain - LEPA 3 GPM 2017 05/2432,000 0.00 11.38 11.38 12.62 24.00 0.00 24.00 260 22.85 10.83 North-4 GPM 05/24 Spain - LEPA 2017 32,000 0.00 13.64 13.64 12.62 26.26 0.00 26.26 270 19.79 10.28 Spain - LEPA **4 GPM** 2017 05/24 32,000 0.00 13.67 13.67 12.62 26.29 0.00 26.29 270 19.75 10.27 Spain - SDI 4 GPM 2017 05/2432,000 0.00 12.49 12.49 13.53 26.02 0.00 26.02 267 21.38 10.26 **Grall - LEPA** 3 GPM 2017 05/27 28,000 11.95 13.08 0.00 24.16 18.04 1.13 11.08 24.16 236 9.77 Krienke - LEPA 3 GPM 2017 05/31 28,000 0.00 13.10 13.10 10.48 23.58 0.00 23.58 228 17.40 9.67 5 GPM 2015 Spain - LEPA 05/29 32,000 27.09 260 9.59 1.31 12.30 13.61 12.77 26.38 0.71 19.10 Spain - LEPA 5 GPM 2017 05/24 32,000 0.00 15.94 15.94 12.62 28.56 0.00 28.56 270 16.94 9.45 Spain - SDI 5 GPM 2017 05/24 32,000 265 0.00 14.65 14.65 13.53 28.18 0.00 28.18 18.09 9.40 Spain - SDI 5 GPM 2016 05/2732,000 0.00 17.44 17.44 24.45 2.07 26.52 246 14.10 7.01 9.27 3 GPM Grall - PMDI 2017 9.15 05/2728,000 1.13 11.95 13.08 11.08 24.16 0.00 24.16 221 16.89 Krienke - LEPA 5 GPM 2016 05/30 33,000 0.00 11.07 11.07 11.74 22.81 1.22 24.03 217 19.60 9.03 Yoder - LESA **4 GPM** 2015 05/12 32,000 1.22 16.40 17.62 16.60 34.22 -3.50 30.72 276 15.66 8.98 Yoder - LESA 3 GPM 2015 05/1232,000 1.22 12.29 13.51 -2.04 28.07 251 18.58 8.94 16.60 30.11 Spain - LEPA **4 GPM** 2015 05/29 32,000 1.31 10.40 11.71 12.77 23.31 2.31 26.79 239 20.41 8.92 3 GPM 2015 22.96 203 Krienke - LEPA 05/31 26,000 0.00 8.81 8.81 10.77 19.58 3.38 23.04 8.84 5 GPM 2016 05/2732,000 Spain - LEPA 0.00 18.91 18.91 25.32 29.52 260 8.81 6.41 4.20 13.75 05/12 **Yoder - LESA** 5 GPM 2015 32,000 1.22 20.57 -3.52 34.87 21.79 16.60 38.39 307 14.09 8.80 Krienke - LEPA 4 GPM 2017 05/31 28,000 0.00 16.13 16.13 10.48 26.61 1.12 27.73 243 15.06 8.76 Spain - LEPA 3 GPM 2015 05/29 32.000 1.31 8.45 9.76 12.77 22.53 3.80 26.33 227 23.26 8.62 Krienke - LEPA **4 GPM** 2016 05/30 29,000 0.00 10.80 10.80 11.74 22.54 2.28 24.82 212 19.63 8.54 **Grall - LEPA** 3 GPM 2016 05/25 30,000 0.00 13.57 13.57 8.78 22.35 1.52 23.87 203 14.96 8.50 Spain - LEPA **4 GPM** 2016 05/2732,000 0.00 18.10 18.10 6.41 24.51 1.31 25.82 217 11.99 8.40 5 GPM 2015 05/31 0.00 12.70 12.70 10.77 2.65 26.12 219 Krienke - LEPA 28,000 23.47 17.24 8.38 Krienke - LEPA 5 GPM 2017 05/31 28,000 0.00 18.75 18.75 10.48 29.23 0.00 29.23 244 13.01 8.34 **4 GPM** 2015 05/31 27.000 10.69 10.69 11.79 22.48 25.14 209 19.55 Krienke - LEPA 0.00 2.66 8.31

Appendix J: 3-Year Summary (2015, 2016, 2017) Bushel Yield Produced from Each Inch of Total Water by Field and Grower, "3-4-5 GPM" Project

Grower	Field	Year	Planting Date	Seeding Rate	Pre-Water (in)	Irrigation (in)	Total Irrigation (in)	Rainfall (in)	Total Rainfall & Irrigation (in)	Net Soil Water (in)	Total Water (in)	Corn Yield (bu/ac)	Yield @ bu/ac-in Irrigation	Yield @ bu/ac-in Total Water
Grall - LEPA	4 GPM	2017	05/27	28,000	2.25	15.59	17.84	11.08	28.92	0.00	28.92	240	13.45	8.30
Grall - PMDI	3 GPM	2016	05/25	30,000	0.00	13.57	13.57	8.78	22.35	4.02	26.37	216	15.91	8.19
Grall - PMDI	5 GPM	2016	05/25	30,000	0.00	15.82	15.82	8.78	24.60	0.00	24.60	198	12.51	8.05
Krienke - LEPA	3 GPM-Early	2017	05/09	32,000	0.00	18.03	18.03	9.49	27.52	0.00	27.52	221	12.26	8.03
Grall - PMDI	4 GPM	2017	05/27	28,000	2.25	15.59	17.84	11.08	28.92	0.00	28.92	228	12.78	7.88
Yoder - LESA	4 GPM	2016	05/14	36,000	0.00	19.90	19.90	7.84	27.74	2.61	30.35	239	12.01	7.87
Grall - PMDI	4 GPM	2016	05/25	30,000	0.00	14.85	14.85	8.78	23.63	1.93	25.56	200	13.47	7.82
Grall - LEPA	5 GPM	2017	05/27	28,000	2.18	19.44	19.44	11.08	30.52	0.00	30.52	237	12.19	7.76
Krienke - LEPA	3 GPM	2016	05/30	26,000	0.00	11.07	11.07	12.31	23.36	3.35	26.73	207	18.70	7.74
Spain - SDI	4 GPM	2016	05/27	32,000	0.00	16.46	16.46	7.01	23.47	4.05	27.52	211	12.82	7.66
Yoder - LESA	3 GPM	2016	05/14	32,000	0.00	14.84	14.84	7.84	22.68	4.30	26.98	203	13.68	7.52
Grall - LESA	4 GPM	2015	05/12	26,000	2.63	14.59	17.22	11.61	28.83	1.83	30.66	230	13.35	7.50
Grall - LEPA	4 GPM	2016	05/25	30,000	0.00	14.85	14.85	8.78	23.63	1.84	25.47	191	12.86	7.50
Grall - PMDI	5 GPM	2017	05/27	28,000	2.18	17.26	19.44	11.08	30.52	0.00	30.52	227	11.67	7.43
Krienke - LEPA	3 GPM-Early	2016	04/25	29,000	0.00	13.11	13.11	13.86	26.97	4.19	31.16	231	17.62	7.41
Grall - LESA	3 GPM	2015	05/12	26,000	2.63	11.84	14.47	11.61	26.08	3.97	30.05	222	15.34	7.38
Yoder - LESA	5 GPM	2016	05/14	38,000	0.00	25.19	25.19	7.84	33.03	1.18	34.21	252	10.00	7.36
Spain - SDI	3 GPM	2016	05/27	32,000	0.00	13.76	13.76	7.01	20.77	5.49	26.26	191	13.88	7.27
Grall - LEPA	5 GPM	2016	05/25	30,000	0.00	15.82	15.82	8.78	24.60	1.67	26.27	190	12.01	7.23
Spain - LEPA	3 GPM	2016	05/27	32,000	0.00	14.82	14.82	6.41	21.23	6.35	27.58	195	13.15	7.07
Grall - LESA	5 GPM	2015	05/12	26,000	2.63	17.20	19.83	11.61	31.44	2.45	33.89	233	11.75	6.87
Grall - PMDI	414 - 4 GPM	2017	05/30	29,270	0.00	16.02	16.02	10.64	26.66	2.05	28.71	195	12.17	6.79
	3 GPM	1	05/23	29,733	0.49	12.12	12.61	10.78	23.39	2.28	25.66	223	18.17	8.74
Overall 3-4-5 Demonstration	4 GPM	1	05/23	30,310	0.57	14.72	15.28	10.90	26.12	1.21	27.39	232	15.66	8.47
Averages	5 GPM	1	05/22	30,733	0.63	16.87	17.36	10.74	28.10	0.84	28.94	242	14.40	8.38
	3 GPM-E	arly	05/01	30,500	0.00	15.57	15.57	11.68	27.25	2.10	29.34	226	14.94	7.72

Appendix J: 3-Year Summary (2015, 2016, 2017) Bushel Yield Produced from Each Inch of Total Water by Field and Grower, "3-4-5 GPM" Project (continued)

Grower	Field	Planting Date	Pre-Water (in)	Irrigation (in)	Total Irrigation (in)		Total Rain & Irrigation (in)		Total Water (in)	Cotton Yield (lb/ac)	Yield @ lb/ac-in Irrigation	Yield @ lb/ac-in Total Water
Spain SDI	3 GPM	5/17	0.00	6.42	6.42	13.17	19.59	3.54	23.13	1189	185	51
Spain SDI	4 GPM	5/17	0.00	7.50	7.50	13.17	20.67	2.20	22.87	1186	158	53
Spain SDI	5 GPM	5/17	0.00	8.58	8.58	13.17	21.75	1.90	23.65	767	89	32

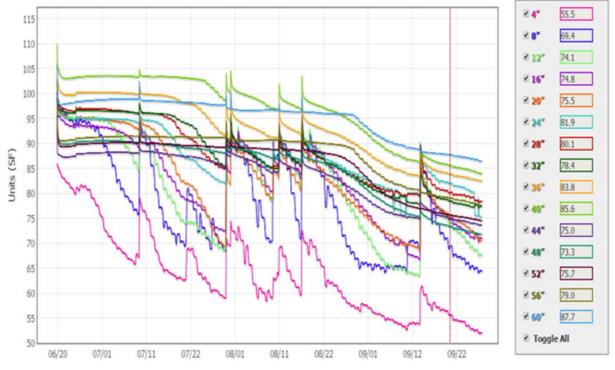
Appendix K: 2017 Cotton "3-4-5 GPM" Project, Spain



Soil Moisture Probes Guided Plant Water Management by:

- * Showing Daily Available Soil Water,
- * Plant Root Growth into the Root Zone, and
- * Rainfall and Irrigation Movement into the Root Zone.

Danny Krienke - 3 GPM



Soil Moisture Sensors Show Available Water at 4-Inch Increments.



Crop Residue Shades the Soil, Maintains Cooler Soil Temperature & Reduces Evaporation

