Derek M. Heeren, Ph.D., P.E.

Professor, Irrigation Engineer, and Associate Head for Academic Programs
Biological Systems Engineering, University of Nebraska–Lincoln
Irrigation and Agricultural Water Management Education Coordinator
Daugherty Water for Food Global Institute, University of Nebraska
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Section 1   Education and Employment History

Section 1.1   Education History

Ph.D., Biosystems Engineering, Oklahoma State University (July 2012)
    Dissertation: Subsurface phosphorus transport and scale dependent phosphorus leaching in alluvial floodplains
    Advisors: Garey A. Fox and Daniel E. Storm

M.S., Engineering, South Dakota State University (May 2008)
    Emphasis: Agricultural and Biosystems Engineering
    Thesis: Evaluation of deficit irrigation strategies for corn
    Advisors: Hal D. Werner and Todd P. Trooien

B.S., Agricultural and Biosystems Engineering, South Dakota State University, May 2004
    Emphasis: Soil and Water Resources Engineering

Section 1.2   Engineering Licensure

Professional Engineer in State of Oklahoma, 2012-present (PE No.: 25541)

Section 1.3   Employment History

University of Nebraska – Lincoln

- *Professor and Irrigation Engineer*, Department of Biological Systems Engineering (2024 – present)
- *Associate Head for Academic Programs*, Department of Biological Systems Engineering (2024 – present)
- *Irrigation and Agricultural Water Management (IAWM) Education Coordinator*, Daugherty Water for Food Global Institute (2019-present)
- *Faculty Fellow*, Daugherty Water for Food Global Institute (2014 – present)
- *Associate Professor and Irrigation Engineer*, Department of Biological Systems Engineering (2018 – 2024), 58% Research, 40% Teaching, 2% Service
- *Assistant Professor and Irrigation Engineer*, Department of Biological Systems Engineering (2012 – 2018), 58% Research, 40% Teaching, 2% Service

Oklahoma State University

- *Research Engineer*, Department of Biosystems and Agricultural Engineering (2008 – 2012)

South Dakota State University

- *Graduate Research Assistant*, Department of Agricultural and Biosystems Engineering (2006 – 2008)

SCI Engineering, Inc., St. Charles, MO
- *Laboratory Supervisor* (2005 – 2006)
- *Engineering Field Technician* (2004 – 2005)

Section 1.4   Career Summary
Research
- Overarching goal: Improve both the sustainability of water resources and the profitability of agricultural production in Nebraska and internationally
- Current research interests: Irrigation management in the Great Plains, sprinkler irrigation, variable rate irrigation, irrigation management based on remote sensing and machine learning, and international irrigation development
- Previous research interests: Subsurface phosphorus transport, streambank erosion, surface water-groundwater interaction, deficit irrigation management, and vadose zone hydrology
- 2,300 citations; h-index = 30 (Google Scholar)
- 37k downloads (UNL Digital Commons)

Teaching
- Overarching goal: Prepare students to be wise managers of irrigation, agricultural systems technology, and water resources
- Focus: Irrigation management in the Great Plains, including undergraduate and graduate programs
- 1 textbook and 1 instructor kit (https://asabe.org/ism)
- $609k in external funding as PI
- Courses taught currently: Irrigation Systems Management, Advanced Irrigation Management, Irrigation Laboratory and Field Course, and Managing Technology in Agricultural Systems
- Courses taught previously: Modeling Vadose Zone Hydrology, Soil Conservation and Watershed Management, Fluvial Hydraulics, and Mechanics of Materials
- Global engagement: Irrigation and Agricultural Water Management (IAWM) Education Coordinator, DWFI, and Partnership Coordinator for DWFI and IHE Delft, to make our educational programs available to an international audience

Section 2   Research Accomplishments

Section 2.1   Publication Record
The following superscripts are used to indicate student co-authors
> *1: Undergraduate Research Assistant under my supervision*
> *2: M.S. student under my supervision*
> *3: Ph.D. student under my supervision*
> *4: Post-Doctoral Research Associate under my supervision*

The parentheses at the end of the citation include my estimated percentage of contribution

Section 2.1.1   Peer-Reviewed Journal Publications in Print
1. Li, J., Ge, Y., Puntel, L. A., Heeren, D. M., Bai, G., Balboa, G. R., Gamon, J. A., Arkebauer, T. J., & Shi, Y. (2025). Devising optimized maize nitrogen stress indices in complex field

conditions from UAV hyperspectral imagery. *Precision Agriculture* 26(3). https://doi.org/10.1007/s11119-024-10205-1

2. Nsoh, B., Katimbo, A., Guo, H., Heeren, D. M., Nakabuye, H. N., Qiao, X., Ge, Y., Rudnick, D. R., Wanyama, J., Bwambale, E., & Kiraga, S. (2024). IoT-based automated solutions utilizing machine learning for smart and real-time irrigation management: A review. *Sensors* 24, 7480. https://doi.org/10.3390/s24237480 (2%)

3. Duan, J., Rudnick, D. R., Proctor, C., Heeren, D. M., Nakabuye, H. N., Katimbo, A., Shi, Y., & de Sousa Ferreira, V. (2024). Estimation of corn nitrogen demand under different irrigation conditions based on UAV multispectral technology. *Agricultural Water Management* 304. https://doi.org/10.1016/j.agwat.2024.109075 (5%)

4. Li, J., Ge, Y., Puntel, L. A., Heeren, D. M., Bai, G., Balboa, G. R., Gamon, J. A., Arkebauer, T. J., & Shi, Y. (2024). Integrating UAV hyperspectral data and radiative transfer model simulation to quantitatively estimate maize leaf and canopy nitrogen content. *International Journal of Applied Earth Observation and Geoinformation* 129: 103817. https://doi.org/10.1016/j.jag.2024.103817 (2%)

5. Gibson, J., Franz, T. E., Gilmore, T. E., Heeren, D. M., Gates, J., Thomas, S., Neale, C. M. U. (2024). Groundwater recharge response to reduced irrigation pumping: Checkbook irrigation and the water savings payment plan. *Water* 16: 2910. https://doi.org/10.3390/w16202910 (2%)

6. Mendes, W. R., Videira, A. M., Er-Raki, S., Heeren, D. M., Dutta, R., & Araújo, F. M. U. (2024). Development of a fuzzy variable rate irrigation control system based on remote sensing data to fully automate center pivots. *IEEE Transactions on Automation Science and Engineering* 21(4): 6109-6125. https://doi.org/10.1109/TASE.2023.3322120 (2%)

7. Kashyap[2], S. P., Heeren, D. M., Maguire, M. S., Woldt, W. E., Irmak, S., Bhatti[3], S., Singh[3], J., Shi, Y., & Neale, C. M. U. (2023). Diurnal soybean water stress computed using statistical-based thermal indices with high-frequency unmanned aircraft flights. *Journal of Natural Resources and Agricultural Ecosystems* 1(1): 33-48. https://doi.org/10.13031/jnrae.15465 (30%)

8. Chandra[2], A., Heeren, D. M., Odhiambo, L., & Brozovic, N. (2023). Water-energy-food linkages in shared smallholder irrigation schemes. *Agricultural Water Management* 289. https://doi.org/10.1016/j.agwat.2023.108506 (20%)

9. Bhatti[3], S., Heeren, D. M., O'Shaughnessy, S. A., Neale, C. M. U., LaRue, J. L., Melvin, S. R., Wilkening[1], E. J., & Bai, G. (2023). Toward automated irrigation management with integrated crop water stress index and spatial soil water balance. *Precision Agriculture*. https://doi.org/10.1007/s11119-023-10038-4 (20%)

10. Gonzalez, H. A., Qiao, X., D'Alessio, M., Dissanayake, D. M. P. B, Heeren, D. M., Biswas, S., Williams, C. F., & Ray, C. (2023). Growing corn and sugar beet with feedlot effluent, air injection, and subsurface drip irrigation system in Western Nebraska. *Journal of Irrigation and Drainage Engineering* 149(3): 04023001. https://doi.org/10.1061/JIDEDH.IRENG-9949 (2%)

11. Timilsina, A. P., Baigorria, G.A., Wilhite, D., Shulski, M., Heeren, D. M., Romero, C., & Fenstereifer, C. (2023). Soybean response under climatic scenarios with changed mean and variability under rainfed and irrigated conditions in major soybean growing states of the United States. *Journal of Agricultural Science* 1–18. https://doi.org/10.1017/S0021859623000011 (2%)

12. Katimbo, A., Rudnick, D. R., Zhang, J., Ge, Y., DeJonge, K. C., Franz, T. E., Shi, Y., Liang, W., Qiao, X., Heeren, D. M., Kabenge, I., Nakabuye, H. N., & Duan, J. (2023). Evaluation of artificial intelligence algorithms with sensor data assimilation in estimating crop evapotranspiration and crop water stress index for precision irrigation water management. *Smart Agricultural Technology* 4. https://doi.org/10.1016/j.atech.2023.100176 (2%)

13. Koehler-Cole, K., Elmore, R. W., Blanco, H., Francis, C. A., Shapiro, C. A., Proctor, C., Ruis, S., Irmak, S., & Heeren, D. M. (2023). Cover crop planting practices determine their performance in USA Corn Belt systems. *Agronomy Journal*. https://doi.org/10.1002/agj2.21247 (2%)

14. Nakabuye, H. N., Rudnick, D. R., DeJonge, K. C., Lo, T., Heeren, D. M., Qiao, X., Franz, T. E., Katimbo, A., & Duan, J. (2022). Real-time irrigation scheduling of maize using Degrees Above Non-Stressed (DANS) Index in semi-arid environment. *Agricultural Water Management* 274. https://doi.org/10.1016/j.agwat.2022.107957 (2%)

15. Bhatti[3], S., Heeren, D. M., Evett, S. R., O'Shaughnessy, S. A., Neale, C. M. U., Rudnick, D. R., Franz, T. E., & Ge, Y. (2022). Crop response to thermal stress without yield loss in irrigated maize and soybean in Nebraska. *Agricultural Water Management* 274. https://doi.org/10.1016/j.agwat.2022.107946 (20%)

16. Maguire, M. S., Neale, C. M. U., Woldt, W. E., & Heeren, D. M. (2022). Managing spatial irrigation using remote-sensing-based evapotranspiration and soil water adaptive control model. *Agricultural Water Management* 272. https://doi.org/10.1016/j.agwat.2022.107838 (5%)

17. Bhatti[3], S., Heeren, D. M., O'Shaughnessy, S. A., Evett, S. R., Maguire, M. S., Kashyap[2], S. P., & Neale, C. M. U. (2022). Comparison of stationary and mobile canopy sensing systems for irrigation management of maize and soybean in Nebraska, USA. *Applied Engineering in Agriculture* 38(2): 331-342. https://doi.org/10.13031/aea.14945 (20%)

18. Singh[3], J., Ge, Y., Heeren, D. M., Walter-Shae, E., Neale, C. M. U., Irmak, S., & Maguire, M. S. (2022). Unmanned aerial system-based data ferrying over a sensor node station network in maize. *Sensors* 22: 1863. https://doi.org/10.3390/s22051863 (10%)

19. Abimbola, O. P., Franz, T. E., Rudnick, D. R., Heeren, D. M., Yang, H., Wolf, A., Katimbo, A., & Nakabuye, H. N. (2022). Improving crop modeling to better simulate maize yield variability under different irrigation managements. *Agricultural Water Management* 262. https://doi.org/10.1016/j.agwat.2021.107429 (2%)

20. Heeren, D. M., Guertault, L., & Mankin, K. R. (2021). Preferential flow in riparian buffers: Current research and future needs. Perspective article. *Transactions of the ASABE* 64(6): 1907-1911. https://doi.org/10.13031/trans.14732 (60%)

21. Singh[3], J., Ge, Y., Heeren, D. M., Walter-Shea, E. A., Neale, C. M. U., Irmak, S., Woldt, W. E., Bai, G., Bhatti, S., & Maguire, M. M. (2021). Inter-relationships between water depletion and temperature differential in row crop canopies in a sub-humid climate. *Agricultural Water Management* 256. https://doi.org/10.1016/j.agwat.2021.107061 (20%)

22. Zhang, J., Guan, K., Peng, B., Pan, M., Zhou, W., Jiang, C., Kimm, H., Franz, T. E., Grant, R., Yang, Y., Rudnick, D. R., Heeren, D. M., Suyker, A. E., Bauerle, W., & Miner, G. (2021). Sustainable irrigation based on co-regulation of soil water supply and atmospheric evaporative demand. *Nature Communications* 12:5549. https://doi.org/10.1038/s41467-021-25254-7 (2%)

23. Zhang, J., Guan, K., Peng, B., Pan, M., Zhou, W., Grant, R., Franz, T. E., Rudnick, D. R., Heeren, D. M., Suyker, A. E., Yang, Y., & Wu, G. (2021). Assessing different plant-centric

water stress metrics for irrigation efficacy using soil-plant-atmosphere-continuum simulation. *Water Resources Research* 57. https://doi.org/10.1029/2021WR030211 (2%)

24. Liang, W., Qiao, X., Possignolo, I. P., DeJonge, K. C., Irmak, S., Heeren, D. M., & Rudnick, D. R. (2021). Utilizing digital image processing and two source energy balance model for the estimation of evapotranspiration of dry edible beans in western Nebraska. *Irrigation Science* 39: 617-631. https://doi.org/10.1007/s00271-021-00721-7 (2%)

25. Zhang, J., Guan, K., Peng, B., Jiang, C., Zhou, W., Yang, Y., Pan, M., Franz, T. E., Heeren, D. M., Rudnick, D. R., Abimbola, O., Kimm, H., Caylor, K., Good, S., Khanna, M., Gates, J., & Cai, Y. (2021). Challenges and opportunities in precision irrigation decision-support systems for center pivots. *Environmental Research Letters* 16: 053003. https://doi.org/10.1088/1748-9326/abe436 (2%)

26. Evett, S. R., Colaizzi, P. D., Lamm, F. R., O'Shaughnessy, S. A., Heeren, D. M., Trout, T. J., Kranz, W. L., & Lin, X. (2020). Past, present and future of irrigation on the U.S. Great Plains. *Transactions of the ASABE* 63(3): 703-729. https://doi.org/10.13031/trans.13620 (5%)

27. Chavez, J. L., Torres-Rua, A. F., Woldt, W. E., Zhang, H., Robertson, C., Marek, G. W., Wang, D., Heeren, D. M., Taghvaeian, S., & Neale, C. M. U. (2020). A decade of unmanned aerial systems in irrigated agriculture in the Western U.S. *Applied Engineering in Agriculture* 36(4): 423-436. https://doi.org/10.13031/aea.13941 (5%)

28. Lo, T., Rudnick, D. R., DeJonge, K. C., Bai, G., Nakabuye, H. N., Katimbo, A., Ge, Y., Franz, T. E., Qiao, X., & Heeren, D. M. (2020). Differences in soil water changes and canopy temperature under varying water × nitrogen sufficiency for maize. *Irrigation Science* 38: 519-534. https://doi.org/10.1007/s00271-020-00683-2 (5%)

29. Barker[4], J. B., Woldt, W. E., Wardlow, B. D., Maguire, M. S., Leavitt, B. C., Neale, C. M. U., & Heeren, D. M. (2020). Calibration of a common shortwave multispectral camera system for quantitative agricultural applications. *Precision Agriculture* 21: 922-935. https://doi.org/10.1007/s11119-019-09701-6 (5%)

30. Bhatti[2], S., Heeren, D. M., Barker[4], J. B., Neale, C. M. U., Woldt, W. E., Maguire, M. S., & Rudnick, D. R. (2020). Site-specific irrigation management in a sub-humid climate using a spatial evapotranspiration model with satellite and airborne imagery. *Agricultural Water Management* 230. https://doi.org/10.1016/j.agwat.2019.105950 (20%)

31. Singh[3], J., Heeren, D. M., Rudnick, D. R., Woldt, W. E., Bai, G., Ge, Y., & Luck, J. D. (2020). Soil structure and texture effects on the precision of soil water content measurements with a capacitance-based electromagnetic sensor. *Transactions of the ASABE* 63(1): 141-152. https://doi.org/10.13031/trans.13496 (20%)

32. Franz, T. E., Pokal, S., Gibson, J. P., Zhou, Y., Gholizadeh, H., Tenorio, F. A., Rudnick, D. R., Heeren, D. M., McCabe, M., Ziliani, M., Jin, Z., Guan, K., Pan, M., Gates, J., & Wardlow, B. D. (2020). The role of topography, soil, and remotely sensed vegetation condition towards predicting crop yield. *Field Crops Research* 252. https://doi.org/10.1016/j.fcr.2020.107788 (5%)

33. Lo, T., Rudnick, D. R., Singh, J., Nakabuye, H. N., Katimbo, A., Heeren, D. M., & Ge, Y. (2020). Field assessment of interreplicate variability from eight electromagnetic soil moisture sensors. *Agricultural Water Management* 231. https://doi.org/10.1016/j.agwat.2019.105984 (5%)

34. Koehler-Cole, K., Elmore, R. W., Blanco-Canqui, H., Francis, C. A., Shapiro, C. A., Proctor, C. A., Ruis, S., Heeren, D. M., Irmak, S., & Ferguson, R. B. (2020). Cover crop productivity

and subsequent soybean yield in the Western Corn Belt. *Agronomy Journal* 112: 2649–2663. https://doi.org/10.1002/agj2.20232 (5%)

35. Barker[4], J. B., Bhatti[2], S., Heeren, D. M., Neale, C. M. U., & Rudnick, D. R. (2019). Variable rate irrigation of maize and soybean in West-Central Nebraska under full and deficit irrigation. *Frontiers in Big Data* 2(34). https://doi.org/10.3389/fdata.2019.00034 (20%)

36. Halihan, T., Miller, R. B., Correll, D., Heeren, D. M., & Fox, G. A. (2019). Field evidence of a natural capillary barrier in a gravel alluvial aquifer. *Vadose Zone Journal* 18:180008. https://doi.org/10.2136/vzj2018.01.0008 (10%)

37. O'Shaughnessy, S. A., Evett, S. R., Colaizzi, P. D., Andrade, M. A., Marek, T. H., Heeren, D. M., Lamm, F. R., & LaRue, J. L. (2019). Identifying advantages and disadvantages of variable rate irrigation – an updated review. *Applied Engineering in Agriculture* 35(6): 837-852. https://doi.org/10.13031/aea.13128 (5%)

38. Lo, T., Rudnick, D. R., Krienke, B. T., Heeren, D. M., Ge, Y., & Shaver, T. M. (2019). Water effects on optical canopy sensing for late-season site-specific nitrogen management of maize. *Computers and Electronics in Agriculture* 162: 154-164. https://doi.org/10.1016/j.compag.2019.04.006 (5%)

39. Mendes, W. R., Araújo, F. M. U., Dutta, R., & Heeren, D. M. (2019). Fuzzy control system for variable rate irrigation using remote sensing. *Expert Systems with Applications* 124: 13-24. https://doi.org/10.1016/j.eswa.2019.01.043 (5%)

40. Finkenbiner, C. E., Franz, T. E., Gibson, J. P., Heeren, D. M., & Luck, J. D. (2019). Integration of hydrogeophysical datasets and empirical orthogonal functions for improved irrigation water management. *Precision Agriculture* 20(1): 78-100. https://doi.org/10.1007/s11119-018-9582-5 (10%)

41. Barker[3], J. B., Heeren, D. M., Neale, C. M. U., & Rudnick, D. R. (2018). Evaluation of variable rate irrigation using a remote-sensing-based model. *Agricultural Water Management* 203: 63-74. https://doi.org/10.1016/j.agwat.2018.02.022 (50%)

42. Barker[3], J. B., Neale, C. M. U., Heeren, D. M., & Suyker, A. E. (2018). Evaluation of a hybrid reflectance-based crop coefficient and energy balance evapotranspiration model for irrigation management. *Transactions of the ASABE* 61(2): 533-548. https://doi.org/10.13031/trans.12311 (20%)

43. Barker[3], J. B., Heeren, D. M., Koehler-Cole, K., Shapiro, C. A., Blanco-Canqui, H., Elmore, R. W., Proctor, C. A., Irmak, S., Francis, C. A., Shaver, T. M., & Mohammed, A. T. (2018). Cover crops have negligible impact on soil water in Nebraska maize-soybean rotation. *Agronomy Journal* 110: 1-13. https://doi.org/10.2134/agronj2017.12.0739 (30%)

44. Freiberger[2,] R. P., Heeren, D. M., Eisenhauer, D. E., Mittelstet, A. R., & Baigorria, G. A. (2018). Tradeoffs in model performance and effort for long-term phosphorus leaching based on in situ field data. *Vadose Zone Journal* 17:170216. https://doi.org/10.2136/vzj2017.12.0216 (50%)

45. Miller, K. A., Luck, J. D., Heeren, D. M., Lo[2], T., Martin, D. L., & Barker[2], J. B. (2018). A geospatial variable rate irrigation control scenario evaluation methodology based on mining root zone available water capacity. *Precision Agriculture*. https://doi.org/10.1007/s11119-017-9548-z (20%)

46. Lo[2], T., Heeren, D. M., Mateos, L., Luck, J. D., Martin, D. L., Miller, K. A., Barker[3], J. B., & Shaver, T. M. (2017). Field characterization of field capacity and root zone available water capacity for variable rate irrigation. *Applied Engineering in Agriculture* 33(4): 559-572. https://doi.org/10.13031/aea.11963 (40%)

47. Barker[3], J. B., Franz, T. E., Heeren, D. M., Neale, C. M. U., & Luck, J. D. (2017). Soil water content monitoring for irrigation management: A geostatistical analysis. *Agricultural Water Management* 188: 36-49. https://doi.org/10.1016/j.agwat.2017.03.024 (30%)

48. Heeren, D. M., Fox, G. A., Penn, C. J., Halihan, T., Storm, D. E., & Haggard, B. E. (2017). Impact of macropores and gravel outcrops on phosphorus leaching at the plot scale in silt loam soils. *Transactions of the ASABE* 60(3): 823-835. https://doi.org/10.13031/trans.12015 (60%)

49. Lo[2], T., Heeren, D. M., Martin, D. L., Mateos, L., Luck, J. D., & Eisenhauer, D. E. (2016). Pumpage reduction by using variable rate irrigation to mine undepleted soil water. *Transactions of the ASABE* 59(5): 1285-1298. https://doi.org/10.13031/trans.59.11773 (30%)

50. Miller, R. B., Heeren, D. M., Fox, G. A., Halihan, T., & Storm, D. E. (2016). Heterogeneity influences on stream water-groundwater interactions in a gravel-dominated floodplain. *Hydrological Sciences Journal* 61(4): 741-750. https://doi.org/10.1080/02626667.2014.992790 (20%)

51. Heeren, D. M., Fox, G. A., & Storm, D. E. (2015). Heterogeneity of infiltration rates in alluvial floodplains as measured with a berm infiltration technique. *Transactions of the ASABE* 58(3): 733-745. https://doi.org/10.13031/trans.58.11056 (80%)

52. Heeren, D. M., Fox, G. A., & Storm, D. E. (2014). Technical note: Berm method for quantification of infiltration at the plot scale in high conductivity soils. *Journal of Hydrologic Engineering* 19(2): 457-461. https://doi.org/10.1061/(ASCE)HE.1943-5584.0000802 (80%)

53. Penn, C. J., Heeren, D. M., Fox, G. A., & Kumar, A. (2014). Application of isothermal calorimetry to the study of phosphorus sorption onto soils in a flow-through system. *Soil Science Society of America Journal* 78(1): 147-156. https://doi.org/10.2136/sssaj2013.06.0239 (20%)

54. Heeren, D. M., Fox, G. A., Fox, A. K., Storm, D. E., Miller, R. B., & Mittelstet, A. R. (2014). Divergence and flow direction as indicators of subsurface heterogeneity and stage-dependent storage in alluvial floodplains. *Hydrological Processes* 28(3): 1307-1317. https://doi.org/10.1002/hyp.9674 (50%)

55. Miller, R. B., Heeren, D. M., Fox, G. A., Halihan, T., Storm, D. E., & Mittelstet, A. R. (2014). The hydraulic conductivity structure of gravel-dominated vadose zones within alluvial floodplains. *Journal of Hydrology* 513: 229-240. https://doi.org/10.1016/j.jhydrol.2014.03.046 (20%)

56. Midgley, T. L., Fox, G. A., Wilson, G. V., Heeren, D. M., Langendoen, E., & Simon, A. (2013). Seepage-induced streambank erosion and instability: In situ constant-head experiments. *Journal of Hydrologic Engineering* 18(10): 1200–1210. https://doi.org/10.1061/(ASCE)HE.1943-5584.0000685 (5%)

57. Midgley, T. L., Fox, G. A., Wilson, G. V., Felice, R. M., & Heeren, D. M. (2013). *In situ* soil pipeflow experiments on contrasting streambank soils. *Transactions of the ASABE* 56(2): 479-488. https://doi.org/10.13031/2013.42685 (5%)

58. Heeren, D. M., Mittelstet, A. R., Fox, G. A., Storm, D. E., Al-Madhhachi, A. T., Midgley, T. L., Stringer, A. F., Stunkel, K. B., & Tejral, R. D. (2012). Using rapid geomorphic assessments to assess streambank stability in Oklahoma Ozark streams. *Transactions of the ASABE* 55(3): 957-968. https://doi.org/10.13031/2013.41527 (50%)

59. Midgley, T. L., Fox, G. A., & Heeren, D. M. (2012). Evaluation of the Bank Stability and Toe Erosion Model (BSTEM) for predicting lateral retreat on composite streambanks. *Geomorphology* 145-146: 107-114. https://doi.org/10.1016/j.geomorph.2011.12.044 (10%)

60. Penn, C. J., McGrath, J. M., Fox, G. A., Rounds, E. W., & Heeren, D. M. (2012). Trapping phosphorus in runoff with a phosphorus removal structure. *Journal of Environmental Quality* 41(3): 672-679. https://doi.org/10.2134/jeq2011.0045 (10%)

61. Heeren, D. M., Trooien, T. P., Werner, H. D., & Klocke, N. L. (2011). Development of deficit irrigation strategies for corn using a yield ratio model. *Applied Engineering in Agriculture* 27(4): 605-614. https://doi.org/10.13031/2013.38207 (80%)

62. Heeren, D. M., Fox, G. A., Miller, R. B., Storm, D. E., Mittelstet, A. R., Fox, A. K., Penn, C. J., & Halihan, T. (2011). Stage-dependent transient storage of phosphorus in alluvial floodplains. *Hydrological Processes* 25(20): 3230-3243. https://doi.org/10.1002/hyp.8054 (50%)

63. Mittelstet, A. R., Heeren, D. M., Storm, D. E., Fox, G. A., White, M. J., & Miller, R. B. (2011). Comparison of subsurface and surface runoff phosphorus transport rates in alluvial floodplains. *Agriculture, Ecosystems and Environment* 141: 417-425. https://doi.org/10.1016/j.agee.2011.04.006 (40%)

64. Miller, R. B., Heeren, D. M., Fox, G. A., Storm, D. E., & Halihan, T. (2011). Design and application of a direct-push vadose zone gravel permeameter. *Ground Water* 49(6): 920-925. https://doi.org/10.1111/j.1745-6584.2010.00796.x (20%)

65. Fox, G. A., Heeren, D. M., Miller, R. B., Mittelstet, A. R., & Storm, D. E. (2011). Flow and transport experiments for a streambank seep originating from a preferential flow pathway. *Journal of Hydrology* 403: 360-366. https://doi.org/10.1016/j.jhydrol.2011.04.014 (20%)

66. Fox, G. A., Heeren, D. M., & Kizer, M. A. (2011). Evaluation of a stream-aquifer analysis test for deriving reach-scale streambed conductance. *Transactions of the ASABE* 54(2): 473-479. https://doi.org/10.13031/2013.36450 (20%)

67. Heeren, D. M., Miller, R. B., Fox, G. A., Storm, D. E., Halihan, T., & Penn, C. J. (2010). Preferential flow effects on subsurface contaminant transport in alluvial floodplains. *Transactions of the ASABE* 53(1): 127-136. https://doi.org/10.13031/2013.29511 (50%)

68. Fox, G. A., Heeren, D. M., Wilson, G. V., Langendoen, E. J., Fox, A. K., & Chu-Agor, M. L. (2010). Numerically predicting seepage gradient forces and erosion: Sensitivity to soil hydraulic properties. *Journal of Hydrology* 389(3-4): 354-362. https://doi.org/10.1016/j.jhydrol.2010.06.015 (30%)

Section 2.1.2   Conference Proceedings Papers

1. Hamid[2], S. O. F., Heeren, D. M., Mittelstet, A. R., Taghvaeian, S., & Ritzema, R. S. (2024). Assessing soil properties for optimized irrigation development in Sudan, Northern Africa. ASABE Annual International Meeting, Paper No. 2400385, Anaheim, Calif. 12 pages. Available at: https://digitalcommons.unl.edu/biosysengpres/81/

2. Adam, O. M. A., Mittelstet, A. R., Heeren, D. M., & Gilmore, T. E. (2024). Enhancing water sustainability in North Africa: Literature review and synthesis of current knowledge gaps in Sudan. ASABE Annual International Meeting, Paper No. 2400159, Anaheim, Calif. 13 pages. Available at: https://digitalcommons.unl.edu/biosysengpres/80/

3. Li, J., Ge, Y., Puntel, L., Heeren, D. M., Balboa, G. R., & Shi, Y. (2023). Combining machine learning with a mechanistic model to estimate maize nitrogen content from UAV-acquired hyperspectral imagery. SPIE Autonomous Air and Ground Sensing Systems for Agricultural Optimization and Phenotyping VIII conference, Tallahassee, Fla. 7 pages. http://dx.doi.org/10.1117/12.2663817

4. Hillyer, C. C., Peters, R. T., Qiao, X., Heeren, D. M., LaRue, J. L., Prestwich, C., & Bhatti[3], S. (2021). Sprinkler irrigation system field checklist. Joint ASABE and Irrigation Association (IA) Decennial National Irrigation Symposium, Paper No. 20-061, San Diego, Calif. 4 pages. Available at: https://digitalcommons.unl.edu/biosysengfacpub/779/.

5. Wilkening[1], E. J., Heeren, D. M., Hallum, D., Schellpeper, J., & Martin, D. L. (2021). Impact of irrigation technologies on withdrawals and consumptive use of water. ASABE Annual International Meeting (virtual), Paper No. 2101114. 11 pages. Available at: https://digitalcommons.unl.edu/biosysengfacpub/765/.

6. Singh[3], J., Heeren, D. M., Ge, Y., Bai, G., Neale, C. M. U., Maguire, M. S., & Bhatti[3], S. (2021). Sensor-based irrigation of maize and soybean in East-Central Nebraska under a sub-humid climate. ASABE Annual International Meeting (virtual), Paper No. 21001044. 12 pages. Available at: https://digitalcommons.unl.edu/biosysengfacpub/763/.

7. Banda[2], M. M., Heeren, D. M., Martin, D. L., Munoz-Arriola, F., & Hayde, L. G. (2019). Economic analysis of deficit irrigation in sugarcane farming: Nchalo Estate, Chikwawa District, Malawi. ASABE Annual International Meeting, Paper No. 1900852, Boston, Mass. 19 pages. Available at: https://digitalcommons.unl.edu/biosysengfacpub/607/.

8. Martin, D. L, Heeren, D. M., Melvin, S. R., & Ingram, T. (2019). Effect of limited water supplies on center pivot performance. Central Plains Irrigation Association (CPIA) Central Plains Irrigation Conference, Kearney, Nebr. 27 pages. Available at: https://digitalcommons.unl.edu/biosysengpres/76/.

9. Li[2], J., Zang, W., Li, Y., Heeren, D. M., & Yan, H. (2018). Comparison of nitrogen fertigation management strategies for center-pivot irrigated maize in the sub-humid area of China. ASABE Annual International Meeting, Paper No. 1801036, Detroit, Mich. 9 pages.

10. Woldt, W. E., Neale, C. M. U., Heeren, D. M., Frew, E., & Meyer, G. E. (2018). Improving agricultural water efficiency with unmanned aircraft. Association for Unmanned Vehicle Systems International (AUVSI) XPONENTIAL trade show and conference, Denver, Colo. 8 pages.

11. Barker[3], J. B., Heeren, D. M., & Neale, C. M. U. (2016). Perspectives on VRI prescription map development with satellite imagery. CPIA Central Plains Irrigation Conference, Kearney, Nebr. 9 pages.

12. Lo[2], T., Heeren, D. M., & Luck, J. D. (2016). Spatial mapping of root zone water holding capacity for site-specific management. CPIA Central Plains Irrigation Conference, Kearney, Nebr. 7 pages.

13. Barker[3], J. B., Neale, C. M. U., & Heeren, D. M. (2015). Evaluation of a hybrid remote sensing evapotranspiration model for variable rate irrigation management – revised. Joint ASABE and Irrigation Association (IA) Irrigation Symposium, Paper No. 2147813, Long Beach, Calif. 10 pages.

14. Lo[2], T. H., Heeren, D. M., Mateos, L., Luck, J. D., Martin, D. L., & Eisenhauer, D. E. (2015). Potential irrigation reductions from increasing precipitation utilization with variable rate irrigation. Joint ASABE and Irrigation Association (IA) Irrigation Symposium, Paper No. 152141446, Long Beach, Calif. 13 pages.

15. Freiberger[2], R. P., Heeren, D. M., Fox, G. A., Penn, C. J., & Eisenhauer, D. E. (2014). Finite element modeling of long-term phosphorus leaching through macropores in the Ozark ecoregion. ASABE Annual International Meeting, Paper No. 141897543, Montreal, Quebec, Canada. 20 pages.

16. Lo[2], T. H., Mateos, L., Heeren, D. M., & Luck, J. D. (2014). The applicability of VRI for managing variability in infiltration capacity and plant-available water: A preliminary discussion and GIS study. ASABE Annual International Meeting, Paper No. 141897710, Montreal, Quebec, Canada. 8 pages.
17. Miller, K. A., Lo[2], T. H., Luck, J. D., & Heeren, D. M. (2014). Combining site specific data with geospatial analysis to identify variable rate irrigation opportunities in irrigated agricultural fields. ASABE Annual International Meeting, Paper No. 141896808, Montreal, Quebec, Canada. 8 pages.
18. Freiberger[2], R. P., Heeren, D. M., & Fox, G. A. (2013). Finite element modeling of phosphorus leaching through floodplain soils dominated by preferential flow pathways. ASABE Annual International Meeting, Paper No. 1583250, Kansas City, Mo. 9 pages.
19. Heeren, D. M., Fox, G. A., Storm, D. E., Haggard, B. E., Penn, C. J., & Halihan, T. (2013). Impact of Measurement Scale on Infiltration and Phosphorus Leaching in Ozark Floodplains. ASABE Annual International Meeting, Paper No. 1621213, Kansas City, Mo. 16 pages.
20. Penn, C. J., Heeren, D. M., & Fox, G. A. (2013). Phosphorus sorption and desorption from soils under flow-through conditions: An investigation of the use of thermal heat patterns as indicators of the degree, mechanisms, and kinetics of sorption reactions. ASABE Annual International Meeting, Paper No. 1621201, Kansas City, Mo. 14 pages.
21. Heeren, D. M., Fox, G. A., Storm, D. E., Storm, P. Q., Haggard, B. E., Halihan, T., & Miller, R. B. (2012). Quantification and heterogeneity of infiltration and transport in alluvial floodplains. ASABE Annual International Meeting, Paper No. 121337097, Dallas, Tex. 20 pages.
22. Heeren, D. M., Fox, G. A., & Storm, D. E. (2012). New berm method to quantify infiltration and transport rates at the plot scale for high hydraulic conductivity soils. ASABE Annual International Meeting, Dallas, Tex. 10 pages.
23. Midgley, T. L., Fox, G. A., Wilson, G. V., Heeren, D. M., Simon, A., & Langendoen, E. J. (2011). Stream bank erosion and instability induced by groundwater seepage: Little Topashaw Creek watershed field experiments. ASABE Annual International Meeting, Louisville, Ky. 21 pages.
24. Heeren, D. M., Mittelstet, A. R., Fox, G. A., & Storm, D. E. (2011). Assessing streambank stability of Oklahoma Ozark streams with rapid geomorphic assessments. ASCE World Environmental and Water Resources Congress, Palm Springs, Calif. 10 pages.
25. Midgley, T. L., Fox, G. A., & Heeren, D. M. (2011). Evaluation of the Bank Stability and Toe Erosion Model (BSTEM) for predicting lateral streambank retreat in Ozark streams. ASCE World Environmental and Water Resources Congress, Palm Springs, Calif. 10 pages.
26. Al-Madhhachi, A. T., Hamad, S. N., & Heeren, D. M. (2011). A new technique to improve the emission uniformity for trickle irrigation systems. ASCE World Environmental and Water Resources Congress, Palm Springs, Calif. 10 pages.
27. Mittelstet, A. R., Heeren, D. M., Storm, D. E., Fox, G. A., White, M. J., & Miller, R. B. (2010). Comparison of subsurface and surface runoff phosphorus transport capacities in alluvial floodplains. ASABE TMDL Meeting, Baltimore, Md. 9 pages.
28. Heeren, D. M., Miller, R. B., Fox, G. A., Storm, D. E., Mittelstet, A. R., & Penn, C. J. (2010). Impact of preferential flow paths on alluvial groundwater flow patterns and phosphorus transport. ASABE Annual International Meeting, Paper No. 1008729, Pittsburgh, Pa. 16 pages.

29. Miller, R. B., Heeren, D. M., Fox, G. A., Storm, D. E., Halihan, T., & Mittelstet, A. R. (2010). Geophysical mapping of preferential flow paths across multiple floodplains. ASABE Annual International Meeting, Paper No. 1008730, Pittsburgh, Pa. 22 pages.
30. Heeren, D. M., Miller, R. B., Fox, G. A., Storm, D. E., Fox, A. K., & Mittelstet, A. R. (2010). Impact of preferential flow paths on stream and alluvial groundwater interaction. ASCE World Environmental and Water Resources Congress, Providence, R.I. 12 pages.
31. Miller, R. B., Heeren, D. M., Fox, G. A., Halihan, T., Storm, D. E., & Mittelstet, A. R. (2010). Use of multi-electrode resistivity profiling to estimate saturated- and vadose-zone hydraulic properties of preferential flow paths in alluvial floodplains. ASCE World Environmental and Water Resources Congress, Providence, R.I. 11 pages.
32. Fox, G. A., Heeren, D. M., & Kizer, M. A. (2010). Evaluation of alluvial well depletion analytical solutions from a stream-aquifer analysis test along the North Canadian River in Oklahoma. ASCE World Environmental and Water Resources Congress, Providence, R.I. 10 pages.
33. Heeren, D. M., Miller, R. B., Fox, G. A., Storm, D. E., Penn, C. J., & Halihan, T. (2009). Preferential flow path effects on subsurface contaminant transport in alluvial floodplains. ASABE Annual International Meeting, Paper No. 095995, Reno, Nev. 10 pages.
34. Heeren, D. M., Fox, G. A., Chu-Agor, M., & Wilson, G. V. (2009). Predicting streambank seepage flows: Sensitivity to soil properties and layering. ASCE EWRI World Environmental and Water Resources Congress, Kansas City, Mo. 10 pages.
35. Heeren, D. M., Werner, H. D., & Trooien, T. P. (2008). Evaluation of deficit irrigation strategies for corn. IA Show, Anaheim, Calif. 15 pages.
36. Heeren, D. M., Werner, H. D., & Trooien, T. P. (2007). Evaluation of irrigation strategies with the DSSAT Cropping System Model. ASABE North Central Intersectional Conference, Paper No. RRV-07132, Fargo, N.D. 13 pages.

Section 2.1.3   Conference Presentations without a Proceedings Paper (since 2020)
1. Singh, A., Taghvaeian, S., Ge, Y., Heeren, D. M., & Bai, F. (2024, October 29). Assessing the AquaCrop model's accuracy for soybean under variable irrigation. Water & Integrated Cropping Systems Conference, Lincoln, Nebr. Poster presentation.
2. Katimbo, A., Nakabuye, H. N., Rudnick, D. R., Heeren, D. M., Qiao, X., Taghvaeian, S., DeJonge, K. C., Duan, J., & Nsoh, B. July 29-31, 2024. Building an Ag-Water Monitoring Platform (A WMP) for water stress detection and developing robust irrigation decision support systems. ASABE Annual International Meeting, Anaheim, Calif.
3. Amori[3], P. N., Heeren, D. M., Shi, Y., Wilkening, E. J., Balboa, G. R., Goncalves, I. Z, & Rudnick, D. R. July 29-31, 2024. Potential of machine learning algorithms for timely and adaptive variable rate irrigation management. ASABE Annual International Meeting, Anaheim, Calif.
4. Ishag[2], M., Mittelstet, A. R., Heeren, D. M., Taghvaeian, S., & Wang, R. July 29-31, 2024. Integrating remote sensing and machine learning to determine past, current, and future withdrawals from the Nubian Sandstone Aquifer System. ASABE Annual International Meeting, Anaheim, Calif.
5. Wilkening[2], E. J., Heeren, D. M., Shi, Y., Katimbo, A., Amori, P. N., Balboa, G. R., Puntel, L. A., Zhang, K., & Rudnick, D. R. July 9-12, 2023. Development of a scalable edge-cloud computing based variable rate irrigation scheduling framework. ASABE Annual International Meeting, Omaha, Nebr. Poster presentation.

6. Katimbo, A., Rudnick, D. R., DeJonge, K. C., Taghvaeian, S., Qiao, X., & Nakabuye, H. N. July 9-12, 2023. A Step towards employing machine learning in developing decision support systems for real-time irrigation scheduling. ASABE Annual International Meeting, Omaha, Nebr.

7. Li, J., Ge, Y., Bai, G., Luck, J. D., Puntel, L. A., Balboa, G. R., Gamon, J. A., Arkebauer, T. J., & Shi, Y. July 9-12, 2023. Advancing the use of UAS-based hyperspectral imaging for nitrogen content estimation and stress detection. ASABE Annual International Meeting, Omaha, Nebr.

8. Wang, L., Li, J., Zhao, B., Baenziger, P. S., Puntel, L. A., K. Frels, Heeren, D. M., Ge, Y., & Shi, Y. July 17-20, 2022. Improve leaf area index estimation with multimodal UAV-derived plant traits. ASABE Annual International Meeting, Houston, Tex.

9. Bhatti[3], S., Heeren, D. M., S. O'Shaughnessy, A., Neale, C. M. U., LaRue, J., Melvin, S. R., Wilkening, E. J., & Bai, G. July 17-20, 2022. Application of a decision support system and spatial evapotranspiration model for site-specific irrigation management of corn and soybean in Nebraska. ASABE Annual International Meeting, Houston, Tex.

10. Wilkening[1], E. J., Heeren, D. M., & Boldt, A. L. July 17-20, 2022. Cyclic failure of water pressure regulators in variable rate irrigation applications. ASABE Annual International Meeting, Houston, Tex.

11. Nakabuye, H. N., Rudnick, D. R., DeJonge, K. C., Lo, T., Franz, T. E., Qiao, X., Heeren, D. M., Katimbo, A., & Duan, J. July 17-20, 2022. Machine learning derived non-stressed canopy temperature for thermal baseline development and irrigation management of maize in semi-arid environments. ASABE Annual International Meeting, Houston, Tex.

12. Lamm, F. R., Aguilar, J. P., Porter, D. O., & Heeren, D. M. July 17-20, 2022. Subsurface drip irrigation, mobile drip irrigation, and the legacy of Freddie Lamm. ASABE Annual International Meeting, Houston, Tex.

13. Kashyap[2], S. P., Heeren, D. M., Woldt, W. E., Irmak, S., Shi, Y., Neale, C. M. U., Maguire, M. S., Bhatti[3], S., & Singh[2], J. October 19, 2021. High-frequency unmanned aircraft flights for crop canopy imaging during diurnal moisture stress. South Dakota Student Water Conference, Brookings, S.D.

14. Bhatti[3], S., Heeren, D. M., O'Shaughnessy, S. A., Neale, C. M. U., Dorsey, N., Ge, Y., Woldt, W. E., & Maguire, M. S. July 12-14, 2021. Comparison of stationary and mobile canopy sensing systems for irrigation management of corn and soybean in Nebraska. ASABE Annual International Meeting (virtual).

15. Singh[3], J., Ge, Y., Heeren, D. M., Bai, G., Neale, C. M. U., Woldt, W. E., Maguire, M. S., & Kashyap[1], S. P. July 12-14, 2021. Unmanned aerial vehicle data mule over a sensor node station network in maize and soybean. ASABE Annual International Meeting (virtual).

16. Wilkening[1], E. J., Heeren, D. M., Ingram, T., Melvin, S. R., Nygren, A., Martin, D. L., Rudnick, D. R., Burr, C., & Mamo, M. July 13-15, 2020. Analyzing operating pressure and application uniformity of center pivot irrigation systems. ASABE Annual International Meeting (virtual). Poster presentation.

17. Singh[3], J., Ge, Y., Bai, G., Heeren, D. M., Walter-Shea, E. A., Neale, C. M. U., Irmak, S., Bhatti[3], S., Woldt, W. E., & Maguire, M. S. July 13-15, 2020. Capturing variability in maize and soybean stress using infrared thermometers and soil water content sensors. ASABE Annual International Meeting (virtual).

18. Bhatti[3,] S., Goncalves, I. Z., Neale, C. M. U., & Heeren, D. M. July 13-15, 2020. Forecasting irrigation management using spatial evapotranspiration model in maize fields in Nebraska. ASABE Annual International Meeting (virtual). Poster presentation.
19. Richardson[1,] J. L., Eisenhauer, D. E., Boldt, A. L., Heeren, D. M., Martin, D. L., Maguire, M. S., Wilkening[1], E. J., Bhatti[3], S., Hayde, L., & Singh[2], J. July 13-15, 2020. Comparing uniform and variable catch can spacing for uniformity tests on center pivot sprinkler systems. ASABE Annual International Meeting (virtual). Poster presentation.
20. Chandra[2], A., Brozovic, N., Odhiambo, L., & Heeren, D. M. July 13-15, 2020. Water-energy linkage in smallholder shared center pivot irrigation: A case study in Rwanda. ASABE Annual International Meeting (virtual).
21. Abimbola, O., Franz, T. E., Heeren, D. M., & Rudnick, D. R. July 13-15, 2020. Developing a scalable real-time sensing and decision-support cyber-physical system for irrigation management. ASABE Annual International Meeting (virtual).
22. Abimbola, O., Franz, T. E., Heeren, D. M., Rudnick, D. R., & Wolf, A. July 13-15, 2020. Simulating maize yield response to irrigation and nitrogen using crop modeling. ASABE Annual International Meeting (virtual).
23. Nakabuye, H. N., Rudnick, D. R., Lo, T., Katimbo, A., Heeren, D. M., DeJonge, K. C., Franz, T. E., & Qiao, X. July 13-15, 2020. Canopy temperature based irrigation scheduling for maize in West Central Nebraska. ASABE Annual International Meeting (virtual).
24. Uwase, E., Heeren, D. M., Odhiambo, L., & Chandra, A. February 18-19, 2020. Evaluating evapotranspiration values in Rwanda while using the Turc and Hargreves-Samani equations. CPIA Central Plains Irrigation Conference, Burlington, Colo. Poster presentation.

Section 2.1.4   Invited Talks or Keynote Speeches (since 2018)
1. Wilkening, E. J., Heeren, D. M., & Bhatti, S. December 5-9, 2022. Triggering irrigation events using pivot-mounted sensors. In Nebraska's Water Balance Story: A Microcosm for Advancing Water Management. Irrigation Association (IA) Irrigation Show and Education Week, Las Vegas, Nev.
2. Heeren, D. M., & Taghvaeian, S. December 2, 2022. Irrigation across the Great Plains. Agronomy and Horticulture Seminar, Lincoln, Nebr.
3. Heeren, D. M., & Bhatti[3], S. August 11, 2022. Pivot automation and early stress detection. DWFI Water for Food from the Field workshop, Paulman Farms, Sutherland, Nebr.
4. Heeren, D. M., & Bhatti[3] S. October 15, 2021. Technology toward pivot automation. DWFI Water for Food Global Forum (virtual).
5. Heeren, D. M. August 21, 2021. Irrigation technology and variable rate irrigation. Presentation to Ukrainian Minister of Agrarian Policy and Food, Lincoln, Nebr.
6. Heeren, D. M., Barker[4], J. B., Bhatti[3], S., Rudnick, D. R., & Munoz-Arriola, F. February 26-27, 2019. Impact of variable rate irrigation (VRI) on consumptive use of water resources. CPIA Central Plains Irrigation Conference, Kearney, Nebr.
7. Heeren, D. M., Barker[4], J. B., Bhatti[2], S., Maguire, M. S., Woldt, W. E., & Neale, C. M. U. September 14, 2018. Variable rate irrigation (VRI): Benefits, limitations, and management practices. Delegation from Irrigation New Zealand, Lincoln, Nebr.
8. Neale, C. M. U., Kaur, R., Hayes, M. J., Heeren, D. M., Kilic, A., Khanna, M., Sarangi, A., Sehgal, V. K., & Sahoo, R. N. July 29-August 1, 2018. Improving water management, agricultural production, and food security in drought-prone areas. ASABE Annual International Meeting, Detroit, Mich.

9. Barker[4], J. B., S. Bhatti[2], Heeren, D. M., & Neale, C. M. U. June 6, 2018. VRI irrigation scheduling. Marena Oklahoma In Situ Sensor Testbed (MOISST) Workshop, Lincoln, Nebr.
10. Heeren, D. M., Barker[4], J. B., Bhatti[2], S., Maguire, M. S., Woldt, W. E., & Neale, C. M. U. April 4, 2018. Variable rate irrigation (VRI): Benefits, limitations, and management practices. Nebraska Water Center (NWC) Water Seminar, Lincoln, Nebr.
11. Heeren, D. M. March 7, 2018. Vadose zone modeling with HYDRUS. Nebraska Association of Resource Districts (NARD) Workshop, Kearney, Nebr.
12. Barker[4], J. B., Neale, C. M. U., & Heeren, D. M. February 21, 2018. Using remote sensing to improve irrigation uniformity. CPIA Central Plains Irrigation Conference, Colby, Kans.
13. Heeren, D. M., Barker[4], J. B., Maguire, M. S., Woldt, W. E., & Neale, C. M. U. January 15, 2018. Drones are buzzing toward increased crop production. IHE Delft Lunch Seminar, Delft, Netherlands.

Section 2.1.5   Extension Publications: Peer-Reviewed
1. Heeren, D. M., Wilkening[2], E. J., Hallum, D., McCullough, C., Keshwani, J., & Schellpeper, J. (2023). Impact of irrigation technologies on water use: Clarifying water withdrawals and consumptive use. NebGuide g2345, Nebraska Extension, with video trailer (3k impressions and 58 reactions on LinkedIn).
2. Lo, T., Rudnick, D. R., Ge, Y., Heeren, D. M., Irmak, S., Barker, J. B., Qiao, X., & Shaver, T. M. (2018). Ground-based thermal sensing of field crops and its relevance to irrigation management. NebGuide G2301, Nebraska Extension.
3. Lo[2], T., Heeren, D. M., Luck, J. D., Martin, D. L., Mateos, L., & Eisenhauer, D. E. (2016). Map for VRI pumping reduction: Potential pumping reductions by using VRI to mine undepleted soil water. Extension website, available at https://heeren.unl.edu/projects/map-vri-pumping-reduction/.

Section 2.1.6   Extension Publications: Other than Peer-Reviewed
1. Heeren, D. M., Mohammed[4], A. T., Wilkening[2], E. J., Neale, C. M. U., Boldt, A. L., Chandra, A., Amori[3], P. N., Goncalves, I. Z., Shi, Y., & Balboa, G. R. (2024). Field research report: Results from the ENREEC VRI Field for the 2021, 2022, and 2023 crop seasons. Technical report submitted to the Eastern Nebraska Research, Extension, and Education Center. Available at: https://digitalcommons.unl.edu/biosysengpres/79/
2. Shi, Y., Heeren, D. M., Wilkening[2], E. J., Goesch[1], J., & Heeren, E. R. (2023). Artificial intelligence for food production. STEM outreach video. (3k impressions and 78 reactions on LinkedIn).
3. Bhatti[3], S., Heeren, D. M., Melvin, S. R., Franz, T. E., Wilkening[2], E. J., & Neale, C. M. U. (2022). Sensors on the pivot for automated irrigation scheduling in the Great Plains. UNL CropWatch, with video trailer (4k impressions and 107 reactions on LinkedIn).
4. Heeren, D. M., Melvin, S. R., Bhatti[3], S., Wilkening[1], E. J., & Neale, C. M. U. (2021). New article traces aspects of the history of irrigation in the Great Plains and water productivity. UNL Water. (Reprinted on UNL CropWatch along with video trailer; 3k impressions and 96 reactions on LinkedIn).
5. Heeren, D. M., Melvin, S. R., Nygren, A., & Wilkening[1], E. J. (2020). Now is the time of year to check pivot performance. Online extension article, UNL Water.

6. Ingram, T., Heeren, D. M., Melvin, S. R., Wilkening[1], E. J., Nygren, A., Martin, D. L., Rudnick, D. R., Burr, C., & Mamo, M. (2019). [Problems regarding operating pressure and uniformity](#). Online extension article, UNL Water.

7. Melvin, S. R., Heeren, D. M., Ingram, T., Nygren, A., Martin, D. L., Mamo, M., Wilkening[1], E. J., & Pitla, S. (2019). [Safety concerns with center pivot irrigation systems](#). Online extension article, UNL Water.

8. Heeren, D. M., Barker[4], J. B., Lo, T. H., Melvin, S. R., Martin, D. L., & Luck, J. D. (2017). [Considerations in adopting variable rate irrigation](#). Online extension article, UNL Water.

9. Koehler-Cole, K., Elmore, R. W., Blanco, H., Francis, C. A., Shapiro, C. A., Shaver, T. M., Stockton, M., Ferguson, R. B., Irmak, S., & Heeren, D. M. (2016). [Implementation of cover crops in corn and soybean systems in Nebraska](#). Online extension article, UNL CropWatch.

10. Koehler-Cole, K., Elmore, R. W., Blanco, H., Francis, C. A., Heeren, D. M, Irmak, S., Proctor, C., Shapiro, C. A., Shaver, T. M., & Stockton, M. (2016). [Biomass production of winter annual cover crops in corn and soybean](#). Online extension article, UNL CropWatch.

11. Fox, G. A., Heeren, D. M., & Kizer, M. A. (2010). Oklahoma Stream Depletion Factor (OSDF) Worksheet. Documented use in N.H., Nebr., Minn., Mont., Okla., Wash., & Scotland.

Section 2.1.7   Extension Presentations
1. Heeren, D. M., Melvin, S. R., & Burr, C. February 28, 2023. Center pivot performance: Impacts during a dry year. Central Plains Irrigation Conference, Kearney, Nebr.

2. Heeren, D. M., Melvin, S. R., & Burr, C. January 10 & 12, 2023. Irrigation scheduling tendencies in wet vs. dry years. Nebraska Extension Crop Production Clinics, Norfolk & Beatrice, Nebr.

3. Heeren, D. M., Melvin, S. R., & Burr, C. January 10 & 12, 2023. Center pivot performance and how a dry year can affect it. Nebraska Extension Crop Production Clinics, Norfolk & Beatrice, Nebr.

4. Heeren, D. M., Bathke, K., & Hanson, E. (2022). [Irrigation in the age of digital ag](#). Podcast interview. Nebraska Extension FarmBits Podcast (3k impressions and 65 reactions on LinkedIn).

5. Heeren, D. M., Melvin, S. R., & Ingram, T. January 29, 2019. Trends in technology for irrigation scheduling. Nebraska Crop Management Conference, Kearney, Nebr.

6. Lo[3], T., D. R. Rudnick, D. M. Heeren, J. D. Luck, and T. M. Shaver. February 21-22, 2017. Fundamentals of variable rate irrigation (VRI). Central Plains Irrigation Conference, Burlington, Colo.

7. Heeren, D. M., Barker[3], J. B., and Neale, C. M. U. February 2, 2017. Managing variable rate irrigation for spatial variability in evapotranspiration using remote sensing. Nebraska Agriculture Technologies Association (NeATA) Conference, Lincoln, Nebr.

8. Heeren, D. M., Werner, H. D., and Trooien, T. P. February 26-27, 2013. Optimizing cropping systems under limited water conditions. Central Plains Irrigation Conference, Kearney, Nebr.

Section 2.2   Grantsmanship Record
Section 2.2.1   Internally Funded Research Grants (since 2018)

Project Title	Sponsor	Role	Dates	Total Amount	% Attributed to Candidate
Near Earth Sensing of Crop Canopy at Production Field Scale Enabled by Unmanned Aircraft	DWFI Grad Student Support	PI	2020-2021	17,500	80
Sensor-Based Irrigation Management for Maize and Soybean in the Great Plains	DWFI Grad Student Support	PI	2018-2021	51,000	70
Integrated Crop and Soil Water Sensor Network to Assist UAS and Soil Water Simulation Modeling in Variable Rate Irrigation	DWFI Grad Student Support	Collaborator	2017-2020	51,000	10
Impact of Variable Rate Irrigation on Consumptive Use of Water Resources	USGS 104(b)	PI	2017-2019	20,000	38
Field Testing Variable Rate Irrigation (VRI) for Managing Spatial Variability in Soils and Evapotranspiration	DWFI Grad Student Support	PI	2016-2018	33,500	90

1. Near Earth Sensing of Crop Canopy at Production Field Scale Enabled by Unmanned Aircraft (2020-2021)
     Sponsor: Daugherty Water for Food Global Institute (DWFI) Grad Student Research Support
     PI: D. M. Heeren; *Collaborator:* W. E. Woldt
     Sponsor Amount: $17,500; *UNL Cost Share:* $17,500; *Estimated percent credit:* 80%
2. Sensor-Based Irrigation Management for Maize and Soybean in the Great Plains (2018-2021)
     Sponsor: DWFI Grad Student Research Support
     PI: D. M. Heeren; *Collaborators:* J. B. Barker, C. M. U. Neale, D. L. Martin, D. R. Rudnick, & X. Qiao
     Sponsor Amount: $51,000; *UNL Cost Share:* $51,000; *Estimated percent credit:* 70%
3. Integrated Crop and Soil Water Sensor Network to Assist Unmanned Aircraft Systems (UAS) and Soil Water Simulation Modeling in Variable Rate Irrigation (2017-2020)
     Sponsor: DWFI Grad Student Research Support
     PI: Y. Ge; *Collaborators:* C. M. U. Neale, D. M. Heeren
     Sponsor Amount: $51,000; *UNL Cost Share:* $51,000; *Estimated percent credit:* 10%
4. Impact of Variable Rate Irrigation on Consumptive Use of Water Resources (2017-2019)
     Sponsor: Nebraska Water Center, U.S. Geological Survey (USGS) 104(b) program
     PI: D. M. Heeren; *Co-PIs:* D. R. Rudnick & F. Munoz-Arriola; *Collaborator:* J. B. Barker
     Sponsor Amount: $20,000; *UNL Cost Share:* $40,002; *Estimated percent credit:* 38%

Section 2.2.2   Externally Funded Research Grants and Contracts

Project Title	Sponsor	Role	Dates	Total Amount	% Attributed to Candidate
Field Testing of Aluvio Irrigation	Irriga Global	Collaborator	2024	24,988	20
Mitigating Tar Spot Disease in Nebraska Irrigated Corn	NE Corn Board	Collaborator	2023-2025	123,406	10
CPS-Enabled Variable Rate Technology	USDA CPS	Collaborator	2021-2025	1,199,687	10
Field Testing of Irrigation Scheduling App	Irriga Global	PI	2023	24,000	60
Field Evaluation of Irrigation Scheduling	AgriThority / Irriga	PI	2022	18,519	80
Enhancing the Efficiency of Irrigation Systems Using Innovative Materials	Pacific Engineering	PI	2022	39,914	55
Towards Pivot Automation with Proximal Sensing for Maize and Soybean in the Great Plains (renewal)	IIC / Valmont	PI	2021-2023	55,000	28
Development of Research and Demonstration Sites in the BGMA for Nitrate Reduction	NET / Lower Elkhorn NRD	Co-PI	2021-2022	272,574	12
Improved Irrigation Scheduling Combining Soil Water Supply and Atmospheric Evaporative Demand	IIC / Industry	Co-PI	2021-2023	197,333	8
Towards Pivot Automation with Proximal Sensing for Maize and Soybean in the Great Plains	IIC / Valmont	PI	2020-2021	94,659	28
Building NRCS Technical Capacity in Irrigation Water Management for Variable Rate Irrigation	USDA NRCS	Co-PI	2020-2023	64,640	10
Row Unit Evaluation in Wet Soils	John Deere	Co-PI	2020	35,000	20
A Scalable Real-Time Sensing and Decision-Making System for Field-Level Row-Crop Irrigation Management	USDA / NSF CPS	Co-PI	2019-2022	319,994	15
SENSE Nitrogen Management: Promoting Adoption of Sensor-Based Nitrogen Fertilization of	Corn Board	Co-PI	2019-2021	277,785	5

Corn through the Nebraska On-Farm Research Network					
Irrigation Innovation Consortium	U.S. Foundation for Food and Agric. Research	Co-PI	2018-2023	675,000	10
Improving Variable Rate Irrigation Efficiency Using a Real-Time Soil Water Adaptive Control Model Informed by Sensors Deployed on Unmanned Aircraft Systems	USDA Foundational Program	Co-PI	2017-2021	499,978	18
Improving Water Management, Agricultural Production and Food Security in Drought-Prone Areas	Indo-U.S. 21st Century Knowledge Initiative	Co-PI	2016-2019	182,804	20
Influence of Preferential Flow on Coupled Colloid, Nitrogen, and Phosphorus Transport through Riparian Buffers	USDA Foundational Program	Co-PI	2016-2019	499,200	5
Selection and Design of Irrigation Systems in Zambia	Zambia Agricultural Research Institute (ZARI) and World Bank	Co-PI	2016-2017	36,074	80
Sustainable Corn and Soybean Production	Nebraska Soybean and Corn Boards	Co-PI	2014-2018	600,000	10
Improving Irrigation Water and Energy Use Efficiency through Accurate Spatial and Temporal Management	Nebraska Center for Energy Sciences Research (NCESR)	Collaborator	2013-2015	129,200	40
Developing CornSoyWater: A Web-based Irrigation Decision Aid for Corn and Soybean in Nebraska	Nebraska Center for Energy Sciences Research (NCESR)	Collaborator	2013-2015	122,000	5
Phosphorus Leaching in Riparian Floodplains: Preferential Flow and Scale	EPA STAR Fellowship	PI	2011-2012	42,000	100
Cow Creek Streambank Stabilization Project	American Recovery and Reinvestment Act	Co-PI	2009-2012	2,000,000	2

1. Field Testing of Aluvio Irrigation in South-Central Nebraska (2024)
   Sponsor: Irriga Global (La Conversion, Lausanne, Switzerland)
   PI: S. Taghvaeian; *Collaborators:* D. M. Heeren, A. Katimbo
   Sponsor Amount: $24,988; *UNL Cost Share:* $0
2. Mitigating Tar Spot Disease in Nebraska Irrigated Corn (2023-2025)
   Sponsor: Nebraska Corn Board
   PI: T. A. Jackson-Ziems; *Co-PIs:* S. Taghvaeian, & D. M. Heeren

Sponsor Amount: $123,406; *UNL Cost Share:* $0

3. CPS-Enabled Variable Rate Technology (2021-2025)
   Sponsor: USDA Cyber-Physical Systems (CPS) program
   PI: Y. She; *Co-PIs:* Y. Ge, K. Zhang, L. A. Puntel, & Y. Zhou; *Collaborators:* D. M. Heeren & D. R. Rudnick
   Sponsor Amount: $1,199,687; *UNL Cost Share:* $0; *Estimated percent credit:* 10%

4. Field Testing of Irrigation Scheduling App in Eastern Nebraska (2023)
   Sponsor: Irriga Global (La Conversion, Lausanne, Switzerland)
   PI: D. M. Heeren; *Co-PI:* A. T. Mohammed
   Sponsor Amount: $24,000; *UNL Cost Share:* $0

5. Field Evaluation of Irrigation Scheduling (2022)
   Sponsor: AgriThority (who is receiving funding from Irriga Global)
   PI: D. M. Heeren; *Co-PI:* A. T. Mohammed
   Sponsor Amount: $18,519; *UNL Cost Share:* $0

6. Enhancing the Efficiency of Irrigation Systems Using Innovative Materials (2022)
   Sponsor: Pacific Engineering (who is receiving funding from Nebraska Department of Economic Development)
   PI: D. M. Heeren; *Co-PI:* Y. A. Dzenis
   Sponsor Amount: $39,914; *UNL Cost Share:* $0

7. Towards Pivot Automation with Proximal Sensing for Maize and Soybean in the Great Plains (renewal) (2021-2023)
   Sponsor: Irrigation Innovation Consortium
   PI: D. M. Heeren; *Co-PIs:* C. M. U. Neale, Y. Ge, W. E. Woldt, & G. Bai; *Collaborators:* N. Dorsey (Valmont Industries), S. A. O'Shaughnessy (USDA ARS), J. A. Kastl (Valmont Industries), D. R. Rudnick, S. R. Evett (USDA ARS), T. E. Franz, S. Bhatti, S. R. Melvin, & T. Ingram.
   Sponsor Amount: $50,000; *UNL Cost Share:* $57,778; *Valmont Cost Share:* $5,000

Section 2.3   Research Awards

Section 2.3.1   National and International Research Awards and Recognition

1. Heermann Sprinkler Irrigation Award. (2023). ASABE Annual International Meeting, Omaha, Nebr.
2. ASABE Superior Paper Award. (2016). For the refereed journal article: Heeren, D. M., Fox, G. A., & Storm, D. E. 2015. Heterogeneity of infiltration rates in alluvial floodplains as measured with a berm infiltration technique. *Transactions of the ASABE* 58(3): 733-745.
3. U.S. EPA Science to Achieve Results (STAR) Fellow. 2011-2012.

Section 2.3.2   Regional and Local Research Awards and Recognition

1. Research Excellence Award. (2021). UNL College of Engineering. Research Recognition Reception, Lincoln, Nebr.
2. Honoree, recognized for performing highly impactful research. (2017). UNL College of Engineering. Research Recognition Reception, Lincoln, Nebr.

Section 3   Teaching Accomplishments

Section 3.1   Courses Taught

1. AGST/MSYM 452/852, Irrigation Systems Management. 2015-2019, 2021-2024.

2. AGEN/AGST/MSYM 854, Irrigation Laboratory and Field Course. 2014, 2016, 2018 (co-taught with Dean Eisenhauer); 2022 (co-taught with Ali Mohammed); 2024 (co-taught with Aaron Mittelstet).
3. AGST 462, Managing Technology in Agricultural Systems. 2024-2025. Co-taught with Rick Stowell.
4. AGST/MSYM 855, Advanced Irrigation Management. 2015, 2017, 2019, 2020, 2023, 2025 (co-taught with Saleh Taghvaeian since 2023).
5. MSYM 462, Equipment Systems. 2018-2023. Co-taught with Rick Stowell.
6. AGEN/BSEN 957, Modeling Vadose Zone Hydrology. 2014 (co-taught with Dean Eisenhauer), 2016, 2018 (co-taught with Tiffany Messer), 2021.
7. MSYM 354, Soil Conservation and Watershed Management. 2012-2014.
8. BAE 6333, Fluvial Hydraulics. 2010. Oklahoma State University.
9. EM 321, Mechanics of Materials. 2007. South Dakota State University.

Section 3.2 Publications Related to Teaching and Learning

Section 3.2.1   Textbook

1. Eisenhauer, D. E., Martin, D. L., Heeren, D. M. (General Editor), & Hoffman, G. J. (2021). *Irrigation Systems Management*. ASABE: St. Joseph, Mich. 347 pages. Open access: CC BY-NC-ND 4.0. https://doi.org/10.13031/ISM.2021. More information, including PowerPoint presentations for each chapter, available at: https://asabe.org/ISM. (20k impressions and 269 reactions on LinkedIn.)

Section 3.2.2   Instructor Resources

1. Heeren, D. M., Taghvaeian, S., Katimbo, A., & Qiao, X. (2024). Irrigation pumping plants: Energy consumption and pumping plant performance. Class handout. Department of Biological Systems Engineering, University of Nebraska-Lincoln. Available at: https://digitalcommons.unl.edu/oerengineering/3/
2. Heeren, D. M., & Eisenhauer, D. E. (2022). *Irrigation Systems Management: Instructor Kit*. ASABE: St. Joseph, Mich. Laboratory/homework assignments with keys, readiness tests (quizzes) with keys, exams with keys, in-class problems, and lecture notes. Includes both a USCS version and an SI version. Available for purchase at: https://asabe.org/ISM. (4k impressions and 72 reactions on LinkedIn.)
3. Heeren, D. M., & Eisenhauer, D. E. (2021). Modeling Vadose Zone Hydrology: Lecture Notes. Department of Biological Systems Engineering, University of Nebraska-Lincoln. 44 pages. Open access: CC BY-NC 4.0. Available at: https://digitalcommons.unl.edu/oerengineering/2/.

Section 3.2.3   Conference Proceedings Papers

1. Heeren, D. M., Hayde, L. G., Eisenhauer, D. E., McCornick, P. G., Mohammed, A. T., Mittelstet, A. R., Boldt, A. L., Qiao, X., Mabie, D. M., & Munoz-Arriola, F. (2023). A graduate-level field course in irrigation and agricultural water management for an immersive learning experience. ASABE Annual International Meeting, Paper No. 2301165, Omaha, Nebr. 17 pages. Available at: https://digitalcommons.unl.edu/biosysengfacpub/852/.

Section 3.2.4   Conference Presentations without a Proceedings Paper

1. Stowell, R. R., Heeren, D. M., & Keshwani, D. R. July 29-31, 2024. Strengthening student skills in evaluating technical and economic aspects of ag technology systems through capstone projects. ASABE Annual International Meeting, Anaheim, Calif.
2. Amori[3], P. N., Mabie, D. M., & Heeren, D. M. July 9-12, 2023. Improving efficiency in curriculum through course content entropy mapping. ASABE Annual International Meeting, Omaha, Nebr.

Section 3.2.5   Invited Talks or Keynote Speeches
1. Heeren, D. M. May 10, 2023. Panelist. Sustainable intensification of smallholder irrigation. DWFI Water for Food Global Conference, Lincoln, Nebr.
2. Heeren, D. M. October 19, 2021. Before we get started, does anyone want to get out? Courage and creativity for career challenges. South Dakota Student Water Conference, Brookings, S.D. Keynote address.
3. Heeren, D. M. April 5, 2013. Perspectives on different phases of a water career. OSU Student Water Conference, Stillwater, Okla. Keynote address.

Section 3.2.6   Other Oral Presentations
1. Heeren, D. M. October 23, 2024. The language of change: Reflections on a non-linear career path. BSE Colloquium, Lincoln, Nebr.
2. Heeren, D. M. September 12, 2024. The UNL irrigation and agricultural water management field course: An immersive learning experience. Nebraska Department of Natural Resources, Lincoln, Nebr.
3. Heeren, D. M. February 24, 2022. Natural resources and irrigation engineers. ASABE Student Branch, Lincoln, Nebr.
4. Heeren, D. M. November 12, 2021. Before we get started, does anyone want to get out? Courage and creativity for career challenges. Annual Meeting, Nebraska Section of ASABE, Norfolk, Nebr.

Section 3.3   Creative Development of Course Materials
Section 3.3.1   Course Portfolios and Reports
1. Heeren, D. M., & Taghvaeian, S. (2023). Peer review of teaching: ET theory, deficit irrigation and consumptive use. BSE Peer Review of Teaching. Department of Biological Systems Engineering, University of Nebraska-Lincoln. Available at: https://digitalcommons.unl.edu/biosysengpres/77/.
2. Heeren, D. M. May 16, 2016. Increasing student attentiveness and engagement in growing Mechanized Systems Management courses. UNL CASNR Instructional Improvement Plan. Final report. Presented at the BSE Annual Undergraduate Curriculum Workshop, Lincoln, Nebr. Available at: https://digitalcommons.unl.edu/biosysengpres/70/.

Section 3.3.2   Other Course Development
1. MSYM/AGEN 232 Power and Machinery Principles. 2021-2022. Developed new course material and a lecture/lab on irrigation pump energy use.
2. AGEN/BSEN/CIVE/GEOL 957 Modeling Vadose Zone Hydrology. 2021. Converted the course to a flipped class format, including high-quality video lectures. Added lab tours which complimented lecture content.

3. MSYM 855 Advanced Irrigation Management. 2019. Updated course content based on stakeholder input and current technology/research. Due to increased student demand, recorded video of lectures in 2019 and offered course in a flipped-class format in spring 2020 (before the pandemic required non-traditional course delivery).
4. AGEN/MSYM 854 Irrigation Laboratory and Field Course. 2018. Formalized the course, which previously had been taught without a unique course number. Added a discussion and assignment focused on the linkages among industry, government, farmers, and research and educational institutions, within the context of irrigated crop production.
5. MSYM 855 Advanced Irrigation Management. 2015. Developed new material on sensors and management practices. Created new quizzes, homework assignments, and exams. Added a journal article discussion which required students to comprehend, critique, and engage current literature in irrigation management.
6. BSEN 998 Modeling Vadose Zone Hydrology. 2014. Developed new material on solute transport, which complemented the existing focus on unsaturated flow in porous media. Subsequently formalized the course as AGEN/BSEN/CIVE/GEOL 957 Modeling Vadose Zone Hydrology.

Section 3.4   Funding Related to Teaching and Learning
Section 3.4.1   Funded Grants and Donations

Project Title	*Sponsor*	*Role*	*Dates*	*Total Amount*	*% Attributed to Candidate*
Graduate-Level Irrigation Workforce Development in Support of Agricultural Transformation in Sudan	Valmont / Zadna	PI	2022-2024	600,000	40
Publication of Irrigation Systems Management Textbook	ASABE Foundation	PI	2020-2021	9,000	40

1. Graduate-Level Irrigation Workforce Development in Support of Agricultural Transformation in Sudan (2022-2024)
   Sponsor: Valmont Industries Inc. (Omaha, Nebr.) and Zadna International Investment Co. Ltd. (Khartoum, Sudan)
   PI: D. M. Heeren; *Co-PIs:* B. Sharpe (UNL IANR), A. R. Mittelstet, & C. Dunsmore (UNL PIESL)
   Sponsor Amount: $600,000; *UNL Cost Share:* $0
   Estimated percent credit: 40%
   This donation from industry is supporting four Sudanese students who are pursuing an MS in Mechanized Systems Management with a specialization in Irrigation and Agricultural Water Management. The students were employed by Zadna and will return to their positions with Zadna in Sudan upon completion of their degrees.
2. Publication of Irrigation Systems Management Textbook (2020-2021)
   Sponsor: Harold Pinches and Glenn Schwab Teaching Materials Fund, ASABE Foundation
   PI: D. M. Heeren; *Co-PIs:* D. E. Eisenhauer, & D. M. Martin; Collaborator: G. J. Hoffman
   Sponsor Amount: $9,000; *UNL Cost Share:* $3,000; *DWFI Cost Share:* $3,000

Section 3.4.2   Proposals Currently Under Review
1.   Transforming the Department of Biological Systems Engineering: A Pathway to Inclusivity, Innovation, and Adaptability (2025-2026)
     Sponsor: NSF Revolutionizing Engineering Departments (RED) program
     PI: M. C. Stone; *Co-PIs:* A. Stone, D. M. Heeren, D. R. Keshwani, & H. A. Diefes-Dux
     Sponsor Amount: $149,532; *UNL Cost Share:* $0

Section 3.5   Postdoctoral Researchers
Section 3.5.1   Post-Doctoral Researchers Supervised
1.   J. Burdette Barker. Start date: June 2017. Completion date: November 2018. Co-supervisors: Christopher Neale & Derek Heeren. Research focus: Irrigation management using a real-time soil water adaptive control model informed by sensors deployed on unmanned aircraft systems. Currently Assistant Professor, Utah State University, Logan, UT.

Section 3.6   PhD Students
Section 3.6.1   PhD Students Supervised
1.   Jamie Duan. Major: Biological Engineering. Dissertation: Integrating Water and Nitrogen Management for Sustainable Agriculture: Optimizing resource use efficiency and maximizing crop productivity. Graduated: Aug 2024. Co-advisors: Daran Rudnick & Derek Heeren. Currently Post-Doctoral Research Associate, Columbia University.
2.   Sandeep Bhatti. Major: Biological Engineering. Dissertation: Thermal sensing for automated irrigation management of maize and soybean in Nebraska. Graduated: May 2022. Advisor: Derek Heeren. Currently Post-Doctoral Research Associate, University of Massachusetts.
2.   Jasreman Singh. Major: Biological Engineering. Dissertation: Design and evaluation of unmanned aerial system based wireless sensor network for irrigation management. Graduated: December 2021. Co-advisors: Yufeng Ge & Derek Heeren. Currently Data Scientist, Caterpillar, Inc., Chicago, IL.
3.   Tsz Him Lo. Major: Biological Engineering. Dissertation: Water and nitrogen interactions in maize production. Graduated: December 2018. Research advisor: Daran Rudnick; academic advisor: Derek Heeren. Currently Assistant Extension/Research Professor, Mississippi State University, Stoneville, MS.
4.   J. Burdette Barker. Major: Biological Engineering. Dissertation: Spatial irrigation management using remote sensing water balance modeling and soil water content monitoring. Graduated: May 2017. Co-advisors: Derek Heeren & Christopher Neale. Currently Assistant Professor, Utah State University, Logan, UT.

Section 3.6.2   PhD Students Currently in Progress
1.   Jean Niwenshuti. Major: Natural Resources Sciences. Expected graduation: August 2026. Advisors: Aaron Mittelstet & Derek Heeren.
2.   Precious N. Amori. Major: Biological Engineering. Expected graduation: December 2025. Co-advisors: Derek Heeren & Daran Rudnick.

Section 3.6.3   PhD Student Committees
1.   Thais M. Jardim. Expected graduation: 2026. Major: Biological Engineering.
2.   Richard J. Ortega. Expected graduation: December 2025. Major: Biological Engineering.

3. Sophia M. Becker. Expected graduation: 2025. Major: Natural Resources Sciences.
4. Chuyang Liu. 2022. Major: Civil Engineering.
5. Hope Nakabuye. 2022. Major: Biological Engineering.
6. Abia Katimbo. 2022. Major: Biological Engineering.
7. Mitchell S. Maguire. 2021. Major: Biological Engineering.
8. Justin P. Gibson. 2018. Major: Natural Resources Sciences.
9. Amit Timilsina. 2017. Major: Natural Resources Sciences.
10. James Chengchou Han. 2016. Major: Agronomy and Horticulture.

Section 3.7   MS Students
Section 3.7.1   MS Students Supervised (Option A)

1. Moaz N. A. Ishag. Major: Mechanized Systems Management. Graduate specialization: Irrigation and Agricultural Water Management. Thesis: Integrated remote sensing and machine learning to determine past, current, and future crop water use from the Nubian Sandstone Aquifer System. Graduated: August 2024. Advisor: Aaron Mittelstet; coadvisor: Derek Heeren. Currently research assistant at DWFI.
2. Ishani Lal. Double major: Agronomy and Horticulture; Agricultural Economics. Agronomy thesis: In-field optimization of soil water parameters for irrigation scheduling. Ag economics thesis: Irrigation-as-a-service for smallholder farmers. Graduated: May 2024. Advisors: Nick Brozovic, Haishun Yang, & Derek Heeren.
3. Eric J. Wilkening. Major: Agricultural and Biological Systems Engineering. Thesis: Development of a machine learning system for irrigation decision support with disparate data streams. Graduated: December 2023. Advisor: Derek Heeren. Currently Spray Application Specialist, Milford, NE (Agrifac Machinery, Netherlands).
4. Suresh Pradhyun Kashyap. Major: Agricultural and Biological Systems Engineering. Thesis: High-frequency unmanned aircraft flights for crop canopy imaging during diurnal moisture stress. Graduated: December 2021. Co-advisors: Derek Heeren & Wayne Woldt. Currently a Teaching Associate, Professor Jayashankar Telangana State Agricultural University, India.
5. Ankit Chandra. Major: Agricultural and Biological Systems Engineering. Thesis: Water-energy-food linkages in shared smallholder irrigation schemes. Graduated: August 2020. Co-advisors: Nick Brozovic & Derek Heeren. Currently a Program Associate at the Daugherty Water for Food Global Institute.
6. Jingjing Li. Major: Hydraulic Engineering, China Agricultural University, including a one-year visit at UNL. Thesis: Effect of different nitrogen fertigation managements on crop growth, water and nitrogen movement for center pivot irrigated maize in the sub-humid area of Northeast China. Graduated: June 2019. Co-advisors: Haijun Yan (CAU Advisor) & Derek Heeren (UNL Advisor). Currently at Intellectual Property Office, Henan Province, China.
7. Sandeep Bhatti. Major: Agricultural and Biological Systems Engineering. Thesis: Variable rate irrigation using a spatial evapotranspiration model with remote sensing imagery and soil water content measurements. Graduated: December 2018. Advisor: Derek Heeren. Currently Post-Doctoral Research Associate, University of Massachusetts.
8. Tsz Him Lo. Major: Agricultural and Biological Systems Engineering. Thesis: Preliminary quantification of variable rate irrigation benefits. Graduated: August 2015. Advisor: Derek Heeren. Currently Assistant Extension/Research Professor, Mississippi State University, Stoneville, MS.

9. Ryan P. Freiberger. Major: Agricultural and Biological Systems Engineering. Thesis: Single- and dual-porosity calibration and long-term modeling of highly conductive floodplain soils in the Ozark ecoregion. Graduated: December 2014. Advisor: Derek Heeren. Currently Environmental Engineer, AECOM, Omaha, Nebr.

Section 3.7.2   MS Students Supervised (Option B)
1. Abdalhakam M. Z. Almagzoop. Major: Mechanized Systems Management. Graduate specialization: Irrigation and Agricultural Water Management. Expected graduation: December 2024. Advisor: Derek Heeren.
2. Suhib O. F. Hamid. Major: Mechanized Systems Management. Master's project report: Assessing soil properties and suitability for optimized irrigation development in Sudan, Northern Africa. Graduate specialization: Irrigation and Agricultural Water Management. Graduated: August 2024. Advisor: Derek Heeren. Currently research assistant in BSE.
3. Mavuto M. Banda. Major: Mechanized Systems Management. Master's project report: Economic analysis of deficit irrigation in sugarcane farming: Nchalo Estate, Chikwawa District in Malawi. Graduated: May 2019. Advisor: Derek Heeren. Double degree program with the DWFI and IHE Delft. Subsequently earned a Ph.D. at Cranfield University, England.
4. Mumba R. Mwape. Major: Mechanized Systems Management. Master's project report: Selection and design of irrigation systems in Zambia. Graduated: May 2017. Advisor: Derek Heeren. Double degree program with the DWFI and IHE Delft. Currently Agricultural Research Officer, Ministry of Agriculture, Lusaka, Zambia.

Section 3.7.3   MS Student Committees
1. Anmol Singh. Expected graduation: 2025. Major: Agricultural and Biological Systems Engineering.
2. Bryan Nsoh. 2024. Major: Agricultural and Biological Systems Engineering.
3. Osman M. A. Adam. 2024. Major: Mechanized Systems Management.
4. Swathi Palle. 2023. Major: Agricultural and Biological Systems Engineering.
5. Henry A. Gonzalez. 2022. Major: Mechanized Systems Management.
6. Isabella P. Possignolo. 2020. Major: Mechanized Systems Management.
7. Mitchell S. Maguire. 2018. Major: Agricultural and Biological Systems Engineering.
8. Moussa Guira. 2018. Major: Earth and Atmospheric Sciences.
9. Xiaochen Dong. 2017. Major: Natural Resources Sciences.
10. Catie E. Finkenbiner. 2017. Major: Natural Resources Sciences.
11. Keith A. Miller. 2015. Major: Agricultural and Biological Systems Engineering.
12. Gustavo Bosch-Rubia. 2015. Major: Mechanized Systems Management.
13. Evordius Rulazi. 2015. Major: Agricultural and Biological Systems Engineering.

Section 3.8   Undergraduate Students

Section 3.8.1   Undergraduate Research Assistants (since 2021)
1. Ethan Wollberg. 2024-current.
2. Claire Reed. 2024.
3. Jenny Goesch. 2023-current.
4. Zach Anderson. 2023.
5. David Heeren. 2021-2023.
6. Jacob Stover. 2022.

7. Aaron Chin. 2021-2022.
8. Eric Wilkening. 2019-2021.
9. Nathan Turner. 2021.

Section 3.8.2   Academic Advising
Average of 11 undergraduate academic advisees per semester in Mechanized Systems
Management from 2014 to 2021 (subsequently transitioned to a different advising model).

Section 3.9   Staff Supervision
1. Alan Boldt. Research Engineer II and Laboratory Manager. 2015-2024.

Section 3.10   Teaching Awards and Recognition
Section 3.10.1   International and National Teaching Awards and Recognition
1. A. W. Farrall Young Educator Award. (2018). ASABE Annual International Meeting, Detroit, Mich.

Section 3.10.2   Regional, Local and University Teaching Awards and Recognition
1. Omtvedt Innovation Award for Teaching. (2023). UNL Institute of Agriculture and Natural Resources. IANR Distinguished Faculty Banquet, Lincoln, Nebr.
2. Distinguished Alumnus Award. (2017). SDSU Department of Agricultural and Biosystems Engineering. In recognition of significant contributions to society and accomplishments which have brought credit to the department. Banquet of Excellence, Brookings, S.D.

Section 3.11   Other Teaching Accomplishments
Section 3.11.1   Guest Lectures (since 2018)
1. Lecture. Decision support systems for irrigation. AGST 316 Technologies and Techniques in Digital Agriculture. 2023-2024.
2. Lecture and lab. Mechanized irrigation equipment. AGST 232 Power and Machinery Principles. 2021-2024.
3. Lecture and lab. Soil hydraulic conductivity. AGEN/BSEN 225 Engineering Properties of Biological Materials. 2018-2019, 2021-2024.
4. Lab. Water droplet kinematics. AGST 109L Physical Principles in Agriculture Lab. 2023-2024.
5. Lecture. Kinematics for center pivots. AGST 109L Physical Principles in Agriculture Lab. 2023.
6. Lab. Hydraulic head demonstration. AGST 162 Introduction to Agricultural Systems Technology. 2023.
7. Lecture. Natural resources and irrigation engineers. AGEN 100 Introduction to Biological Engineering and Agricultural Engineering. 2018-2020, 2022-2023.
8. Lecture. Water in landscapes: Nebraska water management in croplands. PLAS/NRES Agroecology. 2023.
9. Lecture and lab. Irrigation data techniques. MSYM 492/892 Technologies and Techniques in Digital Agriculture. 2020, 2022.
10. Lecture and lab. Pumping and pipeline systems. MSYM 162 Introduction to Mechanized Systems Management. 2018, 2022.

Section 4   Service Accomplishments

Section 4.1   Professional Service

Section 4.1.1   Proposal Review Panels
1. Research Steering Committee, Irrigation Innovation Consortium (2019-2022).

Section 4.1.2   Associate Editor Positions
1. Associate Editor, *Journal of the ASABE* and *Applied Engineering in Agriculture* (2021-current).
2. Guest Associate Editor, *Transactions of the ASABE* and *Applied Engineering in Agriculture* (2020-2021). Special collection on Preferential Flow and Piping in Riparian Buffers.

Section 4.1.3   Reviewer for Journals (since 2021)
1. *Agricultural Water Management*
2. *Journal of the ASABE*
3. *Applied Engineering in Agriculture*
4. *Computers and Electronics in Agriculture*

Section 4.1.4   Leadership Positions in International and National Organizations
American Society of Agricultural and Biological Engineers (ASABE)
1. NRES-04 Program Committee
   - Chair (2024-present), Vice Chair (2023-2024)
2. NRES-07 Nomenclature
   - Past Chair (2024-present), Chair (2022-2024)
3. P-515 Teaching and Learning Resources
   - Chair (2022-present), Vice Chair (2021-2022)
4. M-162 Heermann Sprinkler Irrigation Award Committee
   - Secretary (2023-present), Past Chair (2019-2021), Chair (2017-2019)
5. Fellowship of Christian Agricultural and Biological Engineers
   - Program Coordinator, Prayer Breakfast (2013-present)
6. NRES-24 Irrigation Group
   - Past Chair (2022-2024), Chair (2020-2022), Vice Chair (2018-2020)
7. M-115 Farrall Young Educator Award Committee
   - Past Chair (2020-2021), Chair (2019-2020)
8. NRES-241 Sprinkler Irrigation Committee
   - Past Chair (2017-2019), Chair (2015-2017), Vice Chair (2013-2015)
9. NRES-253 Riparian Zones, Floodplains, and Wetlands Committee
   - Past Chair (2014-2016), Chair (2012-2014), Vice Chair (2011-2012)

Section 4.1.5   Leadership Positions in Regional and Local Organizations
1. Nebraska Section of the ASABE
   - Advisor and Awards Chair (2023-2024), Program Chair (2022-2023), Chair (2021-2022), Program Chair (2020-2021), Secretary-Treasurer / Membership Chair (2019-2020), Publications Chair (2018-2019)
2. Junior Advisor to UNL Mechanized Systems Management (MSYM) Student Club (2018-2023)
3. Founder and Faculty Advisor of the UNL Fountain Wars Student Club (2013-2018)

- Placed 1st (2014), 2nd (2015), 1st (2016), 2nd (2017), and 2nd (2018) at the national Fountain Wars competition (held at the ASABE Annual International Meeting)

Section 4.1.6   Memberships in Professional Organizations (since 2018)
1. American Society of Agricultural and Biological Engineers (ASABE) (2006 – present)
2. Nebraska Section of the ASABE (2013 – present)
3. Central Plains Irrigation Association (2019 – 2023)
4. Soil Science Society of America (SSSA) (2010 – 2023)

Section 4.2   University and College Service
Section 4.2.1   Leadership Positions
1. Irrigation and Agricultural Water Management (IAWM) Education Coordinator, Daugherty Water for Food Global Institute, University of Nebraska (2019-present)

Section 4.2.2   Membership Positions on College-Wide Committees
1. USAID/DWFI Innovation Lab for Irrigation and Mechanized Systems (ILIMS) Program Coordinating Committee (2024-present)
2. UNL College of Engineering (CoE) Environmental Engineering Graduate Committee (2014-2024)
3. Daugherty Water for Food Global Institute (DWFI) Search Advisory Committee for research assistant professor (2021-2022)
4. UNL Institute of Agriculture and Natural Resources (IANR) Search Advisory Committee for two hydrologist faculty positions (2014-2015)

Section 4.3   Unit Service
Section 4.3.1   Leadership Positions on Unit (BSE) Committees
1. Undergraduate Education Committee
   - Chair (2022-present)
2. Search Advisory Committee for Irrigation and Water Resources Engineer faculty position
   - Chair (2021-2022)
3. Soil and Water Curriculum Subcommittee
   - Co-chair (2019-2022)

Section 4.3.2   Membership Positions on Unit (BSE) Committees
1. BSE Advisory Council (2023-present)
2. Undergraduate Education Committee (2022-present)
3. Graduate Education Committee (2019-2022, 2024-present)
4. Promotion and Tenure Committee (2020-2024)
5. Search Advisory Committee for Irrigation Engineering and Management Specialist faculty position (2021-2022)
6. Facilities, Infrastructure, and Technology Committee (2018-2020)
7. Undergraduate Education Committee (2015-2020)
8. Scholarship Committee (2013-2019)

Section 4.4   Other Service Accomplishments
Section 4.4.1   Professional Outreach Activities (since 2018)

1. Judge for graduate student oral and poster presentations, ASABE Annual International Meeting. 2021, 2022.
2. External reviewer for a dossier for promotion to associate professor with tenure. 2019.
3. External reviewer for USGS 104(g) proposal. 2019.

Section 4.4.2   Community Service
1. Co-leader, small group Bible study. 2017-present. Lincoln, Nebr.
2. Heeren, D. 2024. Remembering East Frisian immigrants who settled near German Valley, Illinois: A family history scrapbook. White paper for descendants of East Frisian immigrants. Available at: https://digitalcommons.unl.edu/genealogy/3/.
3. Heeren, D. 2023. Ethnic heritage of the families from East Friesland (Northwest Germany) who migrated to the American Midwest. White paper for descendants of East Frisian immigrants. Available at: https://digitalcommons.unl.edu/genealogy/2/.
4. Invited presentation for student club. February 9, 2022. UNL chapter of Ratio Christi. Lincoln, Nebr.
5. Sunday school teacher. 2013-2015. Lincoln, Nebr.
6. Sunday school teacher. 2009-2011. Stillwater, Okla.
7. Sunday school teacher. 2006-2008. Volga, S.D.