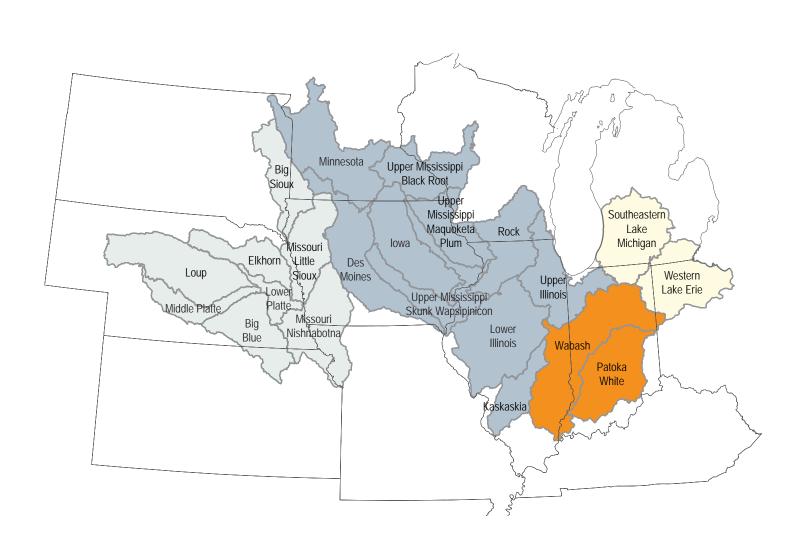




## Farmer Perspectives on Agriculture and Weather Variability in the Corn Belt: A Statistical Atlas



This survey of Midwestern corn producers was implemented through a collaboration of two USDA-NIFA supported projects, *Cropping Systems Coordinated Agricultural Project (CAP): Climate Change, Mitigation, and Adaptation in Corn-based Cropping Systems* (Award No. 2011-68002-30190) and *Useful to Usable (U2U): Transforming Climate Variability and Change Information for Cereal Crop Producers* (Award No. 2011-68002-30220). Additional funding was provided by the Iowa Agriculture and Home Economics Experiment Station, Purdue University College of Agriculture, and the Iowa Natural Resources Conservation Service.

The Climate and Corn-based Cropping Systems Coordinated Agricultural Project is a transdisciplinary partnership among 11 institutions: Iowa State University; Lincoln University; Michigan State University; The Ohio State University; Purdue University; South Dakota State University; University of Illinois; University of Minnesota; University of Missouri; University of Wisconsin; USDA Agricultural Research Service – Columbus, Ohio; and USDA National Institute of Food and Agriculture (USDA-NIFA).

## For more information contact:

Climate and Corn-based Cropping Systems CAP 317 East Hall Iowa State University Ames, Iowa 50011-1070

E-mail: info@sustainablecorn.org Website: sustainablecorn.org

Please cite as: Loy, Adam, Jon Hobbs, J. Gordon Arbuckle Jr., Lois Wright Morton, Linda Stalker Prokopy, Tonya Haigh, Tricia Knoot, Cody Knutson, Amber Saylor Mase, Jean McGuire, John Tyndall, and Melissa Widhalm, 2013. Farmer Perspectives on Agriculture and Weather Variability in the Corn Belt: A Statistical Atlas. CSCAP 0153-2013. Ames, IA: Cropping Systems Coordinated Agricultural Project (CAP): Climate Change, Mitigation, and Adaptation in Corn-based Cropping Systems.

Layout and preparation by Renea Miller, Iowa State University

or call 800-795-3272 (voice) or 202-720-6382 (TDD). USDA is an equal opportunity provider and employer.

## **Contents**

1 Study Overview	1
Map 1. Study watersheds	2
Map 2. Study watersheds overlayed on acres of corn harvested by county in 2007	3
2 Attitudes Toward Adaptive and Mitigative Action	5
Table 1. Attitudes toward various adaptive and mitigative actions to prepare for or address potential changes in climate, percent agree or strongly agree	6
Map 3. Farmers should take additional steps to protect land from increased weather variability, percent agree or strongly agree	7
Map 4. I should take additional steps to protect land from increased weather variability, percent agree or strongly agree	8
Map 5. Seed companies should develop crop varieties adapted to increased weather variability, percent agree or strongly agree	9
Map 6. University Extension should help farmers to prepare for increased weather variability, percent agree or strongly agree	10
Map 7. State and federal agencies should help farmers prepare for increased weather variability, percent agree or strongly agree	11
Map 8. Farm organizations should help farmers to prepare for increased weather variability, percent agree or strongly agree	12
Map 9. Profitable markets for biomass should be developed to encourage planting of perennial crops on vulnerable land, percent agree or strongly agree	13
Map 10. Profitable markets for carbon credits should be developed to encourage use of conservation tillage, cover crops, and other practices, percent agree or strongly agree	14
Map 11. Profitable markets for small grains and other alternative crops should be developed to encourage diversified crop rotations, percent agree or strongly agree	15
Map 12. Government should do more to reduce greenhouse gas emissions and other potential sources of climate change, percent agree or strongly agree	16
Map 13. I should reduce greenhouse gas emissions from my farm operation, percent agree or strongly agree	17
Map 14. Farmers should invest more in agricultural drainage systems to prepare for increased precipitation, percent agree or strongly agree	18
Map 15. Farmers should invest more in irrigation systems to prepare for more frequent drought, percent agree or strongly agree	19
3 Beliefs about Climate Change	21
Table 2. Beliefs about climate change, percent	22
Map 16. Climate change is occurring, and it is caused mostly by human activities, percent	23
Map 17. Climate change is occurring and it is caused more or less <u>equally</u> by natural changes in the environment and human activities, percent	24
Map 18. Climate change is occurring and it is caused mostly by natural changes in the environment, percent	25

Map 19. There is not sufficient evidence to know with certainty whether climate change is occurring or not, percent	26
Map 20. Climate change is not occurring, percent	27
4 Perceived Risk and Experienced Hazard	29
Table 3. Concern about various climate-related threats to farm operations, percent concerned or very concerned	30
Map 21. Increased flooding, percent concerned or very concerned	31
Map 22. Longer dry periods and drought, percent concerned or very concerned	32
Map 23. Increased weed pressure, percent concerned or very concerned	33
Map 24. Increased insect pressure, percent concerned or very concerned	34
Map 25. Higher incidence of crop disease, percent concerned or very concerned	35
Map 26. More frequent extreme rains, percent concerned or very concerned	36
Map 27. Increases in saturated soils and ponded water, percent concerned or very concerned	37
Map 28. Increased heat stress on crops, percent concerned or very concerned	38
Map 29. Increased loss of nutrients into waterways, percent concerned or very concerned	39
Map 30. Increased soil erosion, percent concerned or very concerned	40
Table 4. Experience with various hazards on land farmed, last five years (2007–2011), percent (n = 4,778)	41
Map 31. Experienced significant drought over the past five years, percent	42
Map 32. Experienced significant problems with saturated soils or ponding over the past five years, percent	43
Map 33. Experienced significant flooding over the past five years, percent	44
Map 34. Experienced significant erosion on at least some of my land over the past five years, percent	45
Table 5. Awareness of negative impacts of nutrients and sediment from agriculture on water quality.	46
Map 35. Nutrients and sediment from agriculture have negative impacts on water quality in my state, percent agree or strongly agree	47
5 Influence of Agricultural Actors	49
Table 6. Influence of various agricultural advisors on decisions, average	50
Map 36. Influence of seed dealers on decisions about agricultural practices and strategies, average	51
Map 37. Influence of farm chemical dealers on decisions about agricultural practices and strategies, average	52
Map 38. Influence of NRCS or county Soil and Water Conservation District staff on decisions about agricultural practices and strategies, average	53
Map 39. Influence of state climatologist on decisions about agricultural practices and strategies, average	
Map 40. Influence of University Extension on decisions about agricultural practices and strategies, average	
Map 41. Influence of conservation NGO staff on decisions about agricultural practices and strategies, average	

Map 42. Influence of state departments of agriculture on decisions about agricultural practices and strategies, average	57
6 Capacity	59
Table 7. Perceived capacity to deal with the potential impact of climate change	60
Map 43. Have the knowledge and technical skill to deal with any weather-related threats to the viability of my farm operation, percent agree or strongly agree	61
Map 44. Have the financial capacity to deal with any weather-related threats to the viability of my farm operation, percent agree or strongly agree	62
Map 45. Climate change is not a big issue because human ingenuity will enable us to adapt to changes, percent agree or strongly agree	63
Map 46. Crop insurance and other programs will protect the viability of my farm operation regardless of weather, percent agree or strongly agree	64
Map 47. I am concerned that available best management practice technologies are not effective enough to protect the land I farm from the impacts of climate change, percent agree or strongly agree	
7 Farm and Farmer Characteristics	67
Table 8. Respondents with at least a college education percent	67
Map 48. Respondents with at least a college education, percent	68
Table 9. Farmers who plan to retire in the next 5 years	69
Map 49. Farmers who plan to retire in the next 5 years, percent	70
Table 10. Likelihood that a family member will take over their farm operation when they retire, percent likely or very likely	71
Map 50. Likelihood that a family member will take over the farm operation when they retire, percent likely or very likely	72
Table 11. Farm characteristics	73
Map 51. Acres of land farmed by respondents (owned and rented)	74
Map 52. Percentage of land farmed by respondents that is rented	75
Map 53. In 2011, approximately what percentage of the <u>owned</u> land that you farmed was artificially drained through tile or other methods?	76
Map 54. In 2011, approximately what percentage of the rented land that you farmed was artificially drained through tile or other methods?	77
Map 55. In 2011, approximately what percentage of the owned land that you farmed was irrigated?	78
Map 56. In 2011, approximately what percentage of the rented land that you farmed was irrigated?	79
Map 57. In 2011, approximately what percentage of the <a href="mailto:owned">owned</a> land that you farmed was highly erodible land (HEL) that was planted to crops?	
Map 58. In 2011, approximately what percentage of the <u>rented</u> land that you farmed was highly erodible land (HEL) that was planted to crops?	81
Map 59. In 2011, approximately what percentage of the <u>owned</u> land that you farmed was in no-till?	83

Map 60. In 2011, approximately what percentage of the rented land that you farmed was in no-till?	83
Map 61. In 2011, approximately what percentage of the owned land that you farmed was in cover crops?	84
Map 62. In 2011, approximately what percentage of the <u>rented</u> land that you farmed was in cover crops?	85
8 Weather	87
Map 63. Locations of the National Weather Service Cooperative Observer Network stations in the HUC6 watersheds included in the CSCAP-U2U survey	87
Table 12. Drought monitor categories	88
Table 13. Median seasonal April to Septembe) precipitation from 1971–2011, percentile rank of seasonal precipitation from 2007–2011, and average percentage of extreme daily April to September precipitation for 2007–2011	90
Map 64. Median total April to September precipitation from 1971–2011	
Map 65. Percentile rank of total April to September precipitation for 2007–2011	
Map 66. Average percentage of extreme daily April to September precipitation from 2007–2011	93
Table 14. Median cumulative drought index, aridity index, and standardized annual heat stress degree days from 2007–2011	94
Map 67. Median cumulative drought index for 2007–2011.	95
Map 68. Median aridity index for April to September from 2007–2011.	96
Map 69. Median standardized annual heat stress degree days from 2007–2011	97
9 Marginal Soils	99
Table 15. Land capability classification and definitions	99
Map 70. Percentage of non-irrigated marginal lands by county	100
Appendix A. Farmer Sample Selection	101
Map 71. Study watersheds	104
Table 16. Sample size context and calculation	105
References	107