Water management challenges and potential solutions related to the U.S. federal crop insurance program

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Abstract

The U.S. federal crop insurance program (FCIP), overseen by the U.S. Department of Agriculture Risk Management Agency (USDA RMA), is intended to provide economic stability to U.S. agriculture by providing indemnities to farmers to compensate for losses due to unexpected declines in crop yields, prices, or both. Crop insurance use has increased dramatically over the nearly 100 years since the start of the program, with accelerating widespread usage over the past 30 years, and currently covers approximately 74% of the total potentially insurable crop liability (USDA ERS, 2023). Given the substantial yield and price risk faced by agricultural producers, crop insurance can influence farm production and financing decisions. However, since crop insurance is focused on financial protection and economic stability, its implementation could be at odds with other societal goals, such as water conservation actions. In heavily irrigated agricultural settings, such as the U.S. High Plains aquifer, this suggests that water conservation actions must be compatible with the crop insurance program. To support this effort, we organized a Crop Insurance and Water Management Summit in January 2024 with the goal of identifying research, education, data, and policy needs that could facilitate agricultural water conservation efforts aligned with current or potentially modified crop insurance programs. The summit had 35 participants, comprising representatives of producer, feedyard, research, policy, groundwater management, and extension communities within the state of Kansas. During and after the summit, we identified 10 challenges at the intersection of crop insurance and water management. This report describes each challenge, along with potential solutions, next steps, and obstacles, to provide guidance on potential research, education, data, and policy actions that could help advance water conservation efforts.

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Overview of the Federal Crop Insurance Program

The Federal Crop Insurance Corporation (FCIC), authorized by Congress in 1938, established the federal crop insurance program (FCIP) to support U.S. agricultural production by mitigating the risks and potential financial losses from unforeseen events such as hail, drought, floods, pests, and other hazards (Congressional Research Service, 2021). Today, the U.S. Department of Agriculture's Risk Management Agency (USDA RMA) administers the program, providing producers risk management tools to address crop yield, revenue losses, or both for about 130 crops (Congressional Research Service, 2021; Raszap Skorbiansky et al., 2022). Insurance products for livestock, forage, specialty crops, and diversified farms have expanded over the past two decades and will likely continue to expand (Congressional Research Service, 2021). The program operates through a partnership between approved insurance providers (AIPs) and the FCIC. Each year, AIPs sign a standard reinsurance agreement (SRA) with the FCIC, enabling them to market, underwrite, and adjust claims for crop insurance policies. AIPs then contract with insurance agents, who work directly with agricultural producers to provide insurance coverage. The FCIP has expanded dramatically since its formation, with notable increases associated with such events as the creation of public-private partnerships and changes to cost-share approaches; as of 2021, the FCIP covers about 450 million acres (fig. 1).

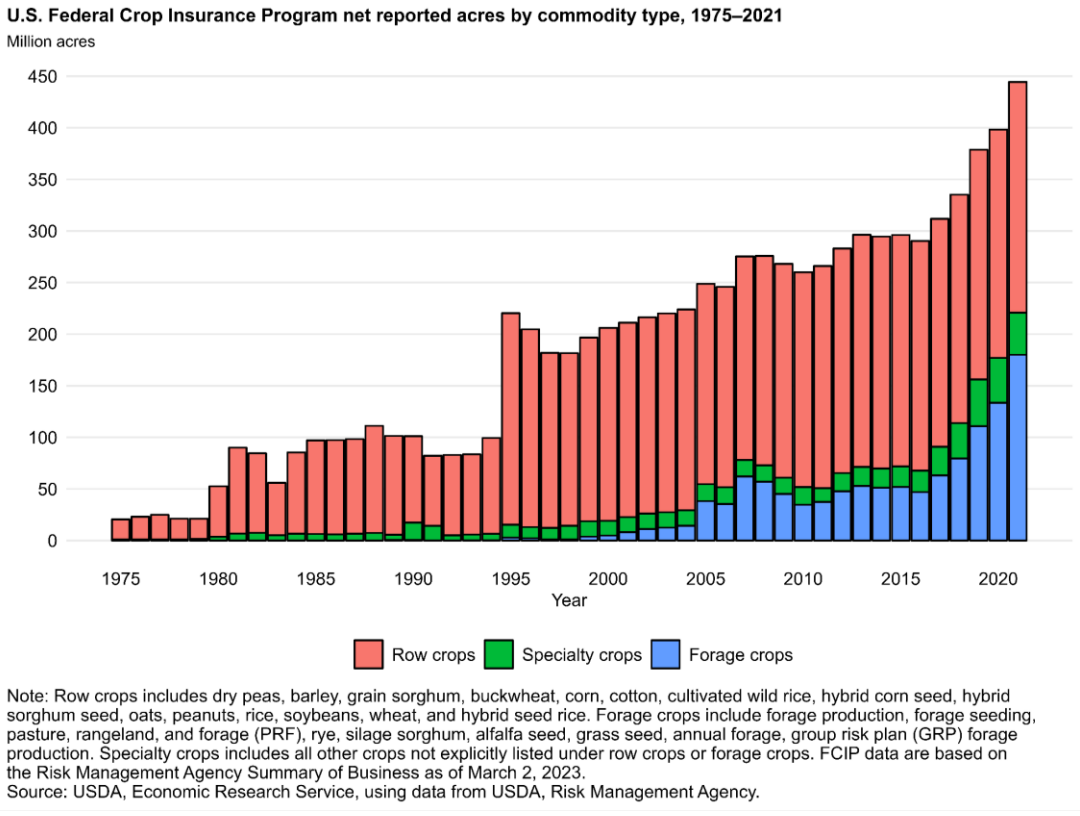

Figure 1. Crop insurance coverage by commodity type, 1975–2021. Source: U.S. Department of Agriculture Economic Research Service (USDA ERS, 2023).

The federal crop insurance program is designed to protect against a wide array of risks, including those affecting yield, price, and overall revenue. Policies within crop insurance vary, with multi-peril crop insurance (MPCI) being the most common. MPCI covers a broad spectrum of risks, including natural disasters and market fluctuations, making it suitable for diverse types of farms. Single peril products, such as pasture, rangeland, and forage (PRF) insurance, insure against a single peril: a decline in precipitation relative to historic levels. Each policy offers many specific options. In Kansas, revenue protection (RP) is the dominant policy, catering to a majority of the staple crops such as wheat, corn, grain sorghum, and soybeans (Kansas Farm Bureau, 2023). Yield protection (YP) policies provide coverage if yield in a given year is below the actual production history (APH) for a specific field due to a covered type of risk. RP policies are more comprehensive, providing coverage for revenue losses due to either reductions in yield or changes in crop prices. Most RP policies use the "harvest price option" (HPO), which resets the guarantee using harvest prices, if harvest prices are lower than projected, or the pre-planting price that is set at the time of purchase. HPO is popular because it tends to increase payouts during widespread droughts, when production shortfalls lead to higher prices. Premiums, eligibility criteria, and benefits also differ among insurance products, and products typically have specific requirements to qualify for coverage, such as accurate reporting; adherence to specified planting dates; and following good farming practices, which can roughly be defined as "all the practices considered prudent and responsible by local extension agents and certified crop consultants to produce your crop's historic yield" (USDA RMA, 2008).

For irrigated agriculture, irrigation is an essential component of good farming practices and, therefore, creates a link between crop insurance and water management. Some studies have suggested that crop insurance coverage is linked to an increase in farmer water use. Deryugina and Konar (2017) found that a 1% increase in insured crop acreage was associated with a 0.22% increase in irrigation withdrawals, which they attributed to expansion of irrigated cotton. Subsequent work found a strong relationship between crop insurance and groundwater withdrawals, with a 1% increase in crop insurance coverage leading to a 0.28% increase in groundwater withdrawals (Deryugina et al., 2021). Additionally, a 2021 study focused on the western United States estimated that a 1% increase in crop insurance premium subsidies was associated with a 0.45% (about 475,901 acre-feet/year) increase in total freshwater withdrawals for irrigation (Ghosh et al., 2023). Although the relationship between crop insurance and irrigation water use will vary for different crops, fields, regions, and irrigation systems, this past work and the existing definitions of good farming practices suggest that crop insurance plays an important role in agricultural water management decision-making.

Because water resources are stressed in many heavily irrigated settings, including much of the Kansas High Plains aquifer (Whittemore et al., 2018), producers and water managers are increasingly interested in adopting water conservation practices to reduce aquifer decline rates (Whittemore et al., 2023). The focus of this report is identifying mechanisms by which water conservation can occur in conjunction with the FCIP in its current form or with modifications.

Changes to the FCIP can occur through adjustments to existing policies or the development of new policies or endorsements. Developing new insurance products or modifying current products typically requires a multiyear development process that is overseen by the FCIC and must be supported by data and analysis that demonstrate actuarial soundness. Developing or modifying insurance products may also involve passing new legislation or changes to existing legislation, such as part of the federal farm bill process that supports the FCIP. Changes in management practices also can be incentivized through additional non-rated subsidies, which provide financial support to producers beyond standard coverage and can be targeted toward specific practices. Many mechanisms outside of the FCIP also can be used to promote water conservation practices; for example, the USDA's Natural Resources Conservation Service (NRCS) can provide financial assistance for water-saving practices such as improved irrigation technology or cover crops.

Table 1. Glossary of common crop-insurance-related terminology used in this report.

Term	**Definition**
AF	Annual forage: A program designed to help cover replacement feed costs when lack of precipitation leads to a loss of annual crops used for forage (feeding livestock).
AIP	Approved insurance provider: A state-chartered property and casualty insurance company that has executed a standard reinsurance agreement (SRA) or livestock price reinsurance agreement (LPRA) with the FCIC.
APH	Actual production history: The historical average of the farmer's yield – or harvest – of a particular crop for a given management unit. APH policies insure producers against yield losses due to natural causes such as drought, excessive moisture, hail, wind, frost, insects, and disease.
FCIC	Federal Crop Insurance Corporation: A wholly owned government corporation that administers the federal crop insurance program. The FCIC promotes the economic stability of agriculture through a sound system of crop insurance.
FCIP	Federal crop insurance program.
Moral Hazard	Situations in which an insured party may take additional risks due to the presence of insurance as a backstop against losses. Also, situations in which an insured party engages in illicit activity to gain or increase a crop insurance payment.
MPCI	Multiple peril crop insurance: The oldest and most common form of the federal crop insurance program in the United States. MPCI protects against crop yield losses by allowing participating producers to insure a certain percentage of historical crop production.
NAP	Noninsured crop disaster assistance program: A program that provides financial assistance to producers of non-insurable crops when low yields, loss of

	inventory, or prevented planting occur due to natural disasters. This program is administered by the USDA Farm Service Agency.
PRF	Pasture, rangeland, and forage: A program designed to help cover replacement feed costs when lack of precipitation leads to a loss of perennial forage for grazing or harvested for hay.
RMA	Risk Management Agency: A U.S. Department of Agriculture agency created in 1996 to operate and manage the FCIC.
SRA	Standard reinsurance agreement: A cooperative financial assistance agreement between the FCIC and an insurance company.
Written agreement	A written agreement is an insurance policy that is individually underwritten and reviewed by RMA regional offices, which can approve, deny, or not accept written agreement requests on behalf of FCIC. Written agreements are often used when an otherwise insurable crop does not have coverage or rates available for a particular county or to alter the terms of policy as authorized under the common crop insurance policy, basic provisions, crop provisions or special provisions of the MPCI.

Summit and Report Overview

Given the critical role of crop insurance in the U.S. agricultural production system, it is essential that potential water conservation approaches be compatible with crop insurance systems. To address this, the Kansas Geological Survey, Kansas State University, and the U.S. Department of Agriculture organized a daylong Crop Insurance and Water Management Summit in January 2024. The goal of the summit was to *identify research, education, data, and policy needs that could facilitate agricultural water conservation efforts aligned with current or potentially modified crop insurance programs*. The summit had 35 attendees (Appendix 1), identified through personal and professional networks, and comprised participants from the producer community, policy groups, groundwater management districts, state and federal agencies, insurance companies, and researchers. The summit was organized around three case studies: (i) forage insurance and the feedyard industry; (ii) limited irrigation insurance options; and (iii) crop failure during drought. Additional time was provided for integrative discussion and for participants to bring up other topics. See Appendix 2 for the full agenda.

Figure 2. Brownie Wilson (Kansas Geological Survey) presenting at the Crop Insurance and Water Management Summit. Photo credit: Landon Marston.

Challenges, Issues, Outcomes, Solutions, and Obstacles

During the summit, organizers and participants collaboratively identified challenges associated with crop insurance and water management as well as potential solutions to address these. After the summit, we organized these into a structured table associated with each challenge, based on an approach used by NASA (2023). For each challenge, the goal was to provide a specific description of the issue and desired outcome and then identify actionable next steps and anticipate any potential obstacles. Table 2 shows the structure used to describe each challenge.

Table 2. Structure used to organize each challenge. Modified from NASA (2023).

Component	Description
Issue	Summary of the primary issue that is creating a water-management challenge.
Desired outcome(s)	Description of the desired outcome(s) that would address or alleviate the water-management challenge.
Solution(s) or next step(s)	Potential actions that, if implemented, could either achieve or make progress toward the desired outcome(s).
Obstacle(s)	Barriers and impediments to implementing the solution(s) or next step(s) to achieve the desired outcome(s).

Table 3. Challenge: The precipitation information used for pasture, rangeland, and forage (PRF) or annual forage (AF) insurance coverage does not always reflect moisture available for forage production.

Issue	PRF insurance provides payments when precipitation within a two-month interval is lower than the historic average. Because coverage is typically based on total precipitation during a specific window of time, it does not account for runoff or other losses of precipitation, which can be important when there are high-intensity rainfall events. For example, a short-duration high-intensity precipitation event could lead to a high precipitation index that is similar to or higher than the historic average, even if most of the precipitation ran off the field and soil moisture values are still low.
Desired outcome(s)	Coverage that aligns more closely with soil moisture conditions, rather than precipitation conditions, would make the product more closely reflect the hydrologic conditions experienced by grazing land or perennial hay crops.
Solution(s) or next step(s)	Defining coverage based on effective precipitation (which is the amount of precipitation that infiltrates into the soil), rather than precipitation, by accounting for runoff. The USDA NRCS's curve number method (U.S. Department of Agriculture, 1986) or another widely accepted approach could be used to more accurately estimate precipitation that infiltrates into the root zone.
Obstacle(s)	● Currently, the USDA RMA's PRF coverage is based on precipitation data from the National Oceanic and Atmospheric Administration (NOAA); any new effective precipitation product would need to be approved, verified, and/or produced by an agency such as NOAA before it is used for PRF coverage. ● Using effective precipitation for coverage would require local validation and historic data to ensure accuracy and demonstrate that it is more strongly correlated with yield than precipitation levels. ● Since precipitation can evaporate in the atmosphere during low-humidity conditions, the effective precipitation product must be ground-based and not satellite- or radar-based.

Table 4. Challenge: Hyperlocal forage prices.

Issue	Insurance pricing is complicated for forage crops. They have relatively high transportation costs and are responsive to local drought and, therefore, have large price variability. Further, there is no futures market for any type of hay, which is necessary for RP or YP policies. These policies have the advantage of pricing based on the current market or the harvest price option (HPO), which can benefit producers during drought by allowing indemnities to be paid out at the harvest futures price if it is higher than the projected price. Though the insured values (guarantee) for PRF and AF largely match the value of non-alfalfa or grass hay under normal prices, these types of policies do not have sufficient flexibility to cover the full value of alfalfa or other high value forage.
Desired outcome(s)	Develop mechanisms that can be used in insurance policies to accurately reflect the value of forage at the time of insurance coverage.
Solution(s) or next step(s)	● Discuss with producers and insurance providers in areas facing water shortages whether insurance is creating a barrier to forage production. ● Explore development of APH products for emerging forage crops, such as the triticale APH. ● Explore development of silage endorsements for existing policies, similar to silage sorghum. ● Explore modifications or expansion of the contract price option for forage policies. ● Explore options to increase the value of the guarantee offered for PRF or AF for high value forage crops.
Obstacle(s)	● No futures markets exist for hay, and several factors outside the control of the FCIP influence development of these products. ● Setting higher county base values or a higher productivity factor for annual forage or PRF could lead to moral hazard. ● Producer demand for a silage endorsement for corn as well as the silage sorghum endorsement and triticale APH have been limited to date; whether technical improvements to existing products will be used is unclear. ● Other than the HPO, FCIP does not have any mechanism to allow an increase in the liability after insurance has attached. Significant policy changes would have to occur to allow an increase in liability.

Table 5. Challenge: Improved flexibility in written agreements for limited irrigation products.

Issue	Written agreements are insurance products that can modify the terms of an existing policy or provide coverage for a situation in which the approach to determine coverage and rates is not standardized. Since written agreements are developed and approved on a case-by-case basis, the process is burdensome as each written agreement needs to be individually tailored. Written agreements are typically used when a product isn't available in a specific county and frequently apply to innovative or new management practices, such as limited irrigation insurance or introducing new water-saving crops to a region. They are highly relevant to potential water conservation efforts.
Desired outcome(s)	A more flexible and smoother process for developing written agreements that enable water conservation practices.
Solution(s) or next step(s)	Written agreement requests are typically developed by a producer and their insurance agent, then sent to an AIP and ultimately to the RMA for review and decision. A process to streamline the flow of information from the producer to the agent to the AIP to the USDA RMA and then back through each of these levels to the producer would facilitate both coverage and payouts for written agreements.
Obstacle(s)	● Written agreements will likely continue to be necessary and relatively time-consuming in any situation in which data are limited, including for new crops or management practices. ● Yield curves to estimate APH and yield potential for a field require individual data, and therefore are inherently individualized. ● Declining well yields mean that production history may no longer be a reasonable approach for estimating current yield potential or best practices. ● For new crops or practices when agreed-upon practices and yield curves do not exist, agricultural expert opinion is needed for coverage and adjustment. This can be inconsistent or challenging to obtain.

Table 6. Challenge: Limited research available on emerging and alternative crops.

Issue	Some low water use crops, such as barley and camelina, are of interest to producers, but the research base for these crops is limited, which causes two problems: (1) Producers need to figure out best management practices for these crops on their own; and (2) USDA RMA does not have good data for developing policies; coverage often requires a written agreement, an agricultural expert opinion, or both.
Desired outcome(s)	Improved data on best management practices and water productivity for emerging, low water use crops, including barley, canola, camelina, triticale, feedyard-specific wheat varieties, and sorghum silage.
Solution(s) or next step(s)	State- or federally funded field trials for these crops and integration into agricultural extension activities to develop and share management best practices.
Obstacle(s)	● Adding field trials for these crops will lead to inevitable tradeoffs with reduced resources available for other crops due to limited funding, personnel, space, equipment, etc. ● Along with the research aspect, economic impacts must be considered – if low water use crops do not provide the financial return comparable to conventional crops, or if low water use crops have an unstable market, producers are less likely to consider these crops.

Table 7. Challenge: Insuring mixed pivots (donut, pizza slice, etc.).

Issue	Fields with a mixture of traditional irrigation and more experimental irrigation practices (for example, a center-pivot system where a producer is trying a new irrigation management approach on a "donut ring" or "pizza slice") within the same management unit are challenging to integrate into existing policy structures because both units would be classified as irrigated. If crop performance is worse in the experimental portion of the field, it may lead to challenges if adjustments are needed. Since sub-field management experiments are one way farmers test new practices, this may limit experimentation and innovation.
Desired outcome(s)	Mechanisms to accommodate mixed practices to allow traditional approaches to irrigation and experimentation within the USDA RMA unit structure.
Solution(s) or next step(s)	Making the written agreement process smoother (see also table 4) could also make it easier to obtain coverage for mixed practices.
Obstacle(s)	● Crop insurance generally does not cover "research-style" practices in which a producer experiments with different approaches to figure out what works best. ● It is challenging to write a written agreement for a portion of a field. ● For a claim, the insured must prove that the practice would work in normal circumstances, which may be challenging for experimental approaches. ● Crop policy mandates the size of the spatial unit and therefore subdividing existing units is not feasible.

Table 8. Challenge: Accounting for declining well yields.

Issue	As well yields decrease due to aquifer depletion, the reduced ability to irrigate can lead to decreases in yield. As a result, APH for a given field may no longer be realistic, especially during drought conditions.
Desired outcome(s)	A mechanism to account for decreasing well yield without going through a written agreement process.
Solution(s) or next step(s)	Programs that encourage or incentivize transitions to or increased rotations with lower water-use crops in fields with declining well yields could alleviate this problem.
Obstacle(s)	● Often requires a written agreement, which is cumbersome (see table 4). ● From an APH perspective, this problem can be somewhat self-correcting, as the decrease in well capacity is generally gradual over time and therefore APH will naturally decrease.

Table 9. Challenge: Crop failure during drought.

Issue	During extreme hot and dry conditions, substantial reductions in crop yield or complete crop failure can occur if irrigation cannot keep up with crop water demand. In some cases, this means that the potential yield benefits from continued irrigation are minimal but irrigation consistent with anticipated yield is required to maintain good farming practices.
Desired outcome(s)	Mechanisms to stop irrigation based on forecast or field conditions more rapidly, particularly if yield benefits are marginal and required pumping volumes are high.
Solution(s) or next step(s)	● A well-validated forecast tool that can determine yield potential based on current conditions and well capacity for use in adjustment. ● Historical estimates of potential water savings that could have been achieved under alternative adjustment approaches.
Obstacle(s)	● Any forecast must be demonstrated to perform better than current approaches (stand count), and therefore would require rigorous comparison to field-resolution data. ○ The USDA RMA is not permitted to share these data, so they would have to come directly from producers to researchers. ● Crop insurance contracts dictate that if there is yield potential, the producer must continue to manage to realize that potential. There is no mechanism for RMA to pay loss if management stops. Therefore, other organizations or programs may be better suited to address this challenge. ● Yield forecasting is particularly challenging when plants are in the vegetative stage.

Table 10. Challenge: Moving water allocations among irrigation sources.

Issue	In many settings, water can be transferred among water rights both by the same user and between users in some cases (current example: Rattlesnake Creek in Kansas).
Desired outcome(s)	Guidance on which wells should be pumped or shut off at which times to comply with regulations and management plans and to maximize potential beneficial use of water.
Solution(s) or next step(s)	A potential web-based tool that integrates regulations could be used to test scenarios for specific areas.
Obstacle(s)	● This challenge is largely separate from crop insurance issues, though any movement of water would need to consider crop insurance to ensure that management was consistent with yield potential on affected fields.

Table 11. Challenge: Appropriately valuing unused water

Issue	Effective market-based approaches to promote water conservation require a way to quantify the value of water that was saved.
Desired outcome(s)	A price table or tables with estimated values of water savings that can be used to calculate the potential value of different conservation activities.
Solution(s) or next step(s)	● Quantify water savings associated with different conservation activities. ● Estimate potential value of water in the future under different scenarios.
Obstacle(s)	● Value of water is very difficult to determine. ● Valuing water saved for the future will be strongly influenced by assumptions such as discount rate, future market conditions, and related factors.

Table 12. Challenge: Improved education regarding crop insurance.

Issue	Crop insurance is extremely complicated, which means that insurance agents and producers are not always aware of options they might be interested in. Once people know about improved options, they can adopt them. Although crop producers are very familiar with RP options, they have more limited awareness of new endorsements, livestock policies, and forage policies.
Desired outcome(s)	Increased awareness among producers, agents, researchers, and other interested parties regarding crop insurance options.
Solution(s) or next step(s)	● Continuing education efforts for insurance agents and other service providers to keep them abreast of developments. ● Instructional YouTube videos may reach a wider audience than big crop insurance manuals. ● Increased Extension education efforts, which can be facilitated through USDA funding mechanisms such as the North Central Extension Risk Management Education Center or other funding programs focused on producer education. ● Advancement of existing decision support tools into educational efforts, such as the limited irrigation crop insurance/water conservation area calculator (Wilson and Rockel, 2017). ● Encourage collaboration among agents, AIPs, and USDA RMA to share knowledge and options.
Obstacle(s)	● The FCIP is an extremely complicated system with substantial regional variance. ● Producers tend to get information and options from insurance agents as well as a wide variety of media and other information sources. ● Agent fee and commission structures can disincentivize certain policies, often more complex ones. ● The number of USDA RMA and Extension staff in the region available for training and outreach is limited. ● Efforts to simplify crop insurance may be met with resistance, as the complexities may have been brought to RMA originally by stakeholder groups as perceived improvements to the program.

Synthesis and Conclusions

The FCIP is a widespread and growing program intended to provide economic stability for the U.S. agricultural system. Because it covers a majority of potentially insurable crops, it plays a large role in farm-level decision-making and likely affects water use in irrigated landscapes. It is critical, therefore, that water conservation activities be compatible with the FCIP. To support this effort, we organized a Crop Insurance and Water Management Summit in January 2024 with the goal of identifying research, education, data, and policy needs that could facilitate agricultural water conservation efforts aligned with current or potentially modified crop insurance programs. The summit had 35 participants, comprising representatives of producer, feedyard, research, policy, groundwater management, and extension communities within the state of Kansas. During and after the summit, we identified 10 challenges at the intersection of crop insurance and water management. Tables 3–12 describe these challenges.

This report highlights both challenges and opportunities to promote water conservation activities within the FCIP. Several common factors underlie many of the challenges. First, crop insurance typically covers production in the current year, and mechanisms are limited to support farming practices that may reduce yield in the current year but potentially provide long-term benefits for yield and profitability, such as water conservation to extend the lifespan of the aquifer. Because groundwater depletion can have large local and regional economic impacts (Deines et al., 2020), and groundwater withdrawals are expected to intensify as a result of climate change (Obembe et al., 2023), water conservation actions that cause short-term economic losses may promote long-term regional economic prosperity. However, evidence also suggests that in some regions, such as the Sheridan-6 Local Enhanced Management Area (SD-6 LEMA), water use has been substantially reduced without negative impacts on producer profit (Golden, 2018). The formation of the SD-6 LEMA was facilitated by RMA's development of limited irrigation insurance products (such as described in table 5) for producers in this region.

A second overarching challenge is insurance product design, including considerations of both moral hazard and actuarial soundness. Due to moral hazard, or the risk that individuals may try to game the system to their own benefit, rules surrounding crop insurance are designed to minimize subjectivity and address potential workarounds, though this can hamper flexibility in some cases. For example, many innovative conservation practices will deviate from historical management practices and, to avoid moral hazard, may require written agreements (table 5) or adjustments to standard good farming practices or loss adjustment, which can be cumbersome. Policy attributes that address moral hazard are one component of actuarial soundness, which is legislatively mandated for all crop insurance products. Detailed historic data are typically necessary for the development of new policies and endorsements, so yield and price risk can be accurately measured and priced. The need for historic data can create a lag between the time that practices are introduced, data become available, and new insurance products are offered. Further, in some cases, data availability for crop insurance purposes may be limited for practices that are otherwise suitable for conservation purposes (table 6).

Given the interlinked current year, moral hazard, actuarial soundness, and data challenges, no single answer can address water conservation challenges through the FCIP. In the challenges detailed in this report, several options merit further exploration. However, in some cases, advancing practices that require short-term reductions in yield to obtain long-term benefits may be better suited for other agencies (such as the USDA NRCS or USDA Farm Service Agency [FSA]) or programs (such as Regional Conservation Partnership Programs, or RCPPs) that can provide incentives for their adoption. An approach to value water that has been conserved in a specific field (table 11) would enhance these efforts by providing a standardized financial metric for these programs.

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Appendix 1: Summit Participants

Name	Organization
Andy Hubert	Farmers National
Angie Brownrabbit	Kansas Geological Survey
Brownie Wilson	Kansas Geological Survey
Cecilia Yu	Kansas Geological Survey
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David Engelhaupt	Kansas Department of Agriculture
Dwane Roth	Front Porch Farms LLC
Forrest Melton	National Aeronautics and Space Administration
Jane Schuh	Kansas State University
Jennifer Ifft	Kansas State University
Jim Butler	Kansas Geological Survey
Jisang Yu	Kansas State University
Justin Jenkins	Foote Feeders
Katie Durham	Western Kansas Groundwater Management District No. 1
Landon Marston	Virginia Tech
Luc Valentin	Labache Ag, Inc.
Lynn Goossen	Goossen Farms
Mahbubur Rahman	Kansas Geological Survey
Malena Orduna Alegria	Kansas Geological Survey
Mark Callender	Western Kansas Groundwater Management District No. 1
Mark Nelson	Kansas Farm Bureau
Matt Unruh	Kansas Water Office
Nathan Hendricks	Kansas State University
Catherine Obiribea Ofori-Bah	Kansas State University
Pat Janssen	WaterPACK & ILS Farm
Robert DuBois	U.S. Department of Agriculture
Robin Reid	Kansas State University

Ryan Flickner	Kansas Farm Bureau
Sam Zipper	Kansas Geological Survey
Shannon Kenyon	Northwest Kansas Groundwater Management District No. 4
Susan Metzger	Kansas State University
Troy Dumler	The Garden City Company
Vijay Ramasamy	Office of Kansas Governor

Appendix 2: Summit Agenda

Crop Insurance and Water Management Summit

January 31, 2024 - 9:30 AM - 4:00 PM

Organizers: Sam Zipper, Kansas Geological Survey; Susan Metzger, Kansas State University; Collin Olsen, US Department of Agriculture

Goal: Identify research, education, data, and policy needs that could facilitate agricultural water conservation efforts aligned with current or potentially modified crop insurance programs.

Location: Kansas Department of Agriculture, Manhattan KS - large conference room

Agenda:

- 9:30-10:00 AM - Sam - Welcome, intros, overview of agenda + goals
- 10:00-11:00 PM - Susan - Forage insurance and feedyards
    - Panel: Brownie Wilson, Jennifer Ifft
    - Collaborative discussion
- 11:00-11:15 AM - Break
- 11:15-12:15 PM - Collin - Case study: Limited irrigation insurance
    - Panel: Collin Olsen, Pat Janssen
    - Collaborative discussion
- 12:15-1:00 PM - Lunch
- 1:00-2:00 PM - Sam - Case study: Crop failure during drought
    - Panel: Dwane Roth, Forrest Melton, Collin Olsen
    - Collaborative discussion
- 2:00-2:15 PM - Break
- 2:15-3:30 PM - Discussion - Common themes and things we missed
- 3:30-4:00 PM - Wrap up, farewells, next steps