August 26, 2025.

POLICY LAB ON WATER SUSTAINBILITY IN ALBERTA'S AGRICULTURE THROUGH DIGITALIZATION

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POLICY LAB ON WATER SUSTAINABILITY IN ALBERTA'S AGRICULTURE THROUGH DIGITALIZATION

PRELIMINARY REPORT*
August 26, 2025.

Juhi Huda[1†], Roshanne Sihota[1], Guillaume Lhermie[1]

[1]Simpson Centre for Food and Agricultural Policy, Faculty of Veterinary Medicine, University of Calgary, Calgary, AB, Canada

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† Corresponding author: juhi.huda@ucalgary.ca

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INTRODUCTION

At the Simpson Centre, we believe that real change in water sustainability in agriculture requires more than just scientific knowledge – it needs the firsthand experience of all involved. That's why we invited participants from the agricultural sector to be part of an exciting initiative: co-creating a roadmap for water sustainability in Alberta's agriculture through digitalization.

As part of the Alberta Digitalization Agriculture (ABDIAG) program, funded by the Ministry of Agriculture and Irrigation, Government of Alberta, the Simpson Centre launched a Policy Lab of 3 sessions to bring together diverse voices from the agricultural sector. The aim of this collaborative effort is to shape innovative policies that leverage digitalization to ensure a sustainable water future for Alberta's agriculture.

Purpose: To address Alberta's water availability challenges in agriculture, this policy lab aims to create a roadmap for improving water sustainability in agriculture through digitalization. Crop and livestock producers, researchers, industry experts, government officials, irrigation districts, and other participants will collaborate to develop a plan to optimize water use, protect the environment, and support business growth.

Where We Are in the Journey: This Policy Lab is a multi-phase initiative designed to foster collaboration and generate impactful solutions:

Session 1 (November 27th, 2024 - Completed): In the first session, we worked together to define the problem, identifying key challenges in water sustainability within Alberta's agricultural landscape.

Session 2 (March 4th, 2025 - Completed): In the second session, we focused on producers' needs, challenges, and opportunities when it comes to leveraging digital tools to enhance water sustainability in Alberta's agriculture; and discussions focused on identifying key areas for policy interventions.

Session 3 (Upcoming later in 2025): To bring together the insights from the first and second policy lab sessions to create a comprehensive policy roadmap for water sustainability through digitalization in Alberta's agriculture.

Before diving into the summary of the discussions from the first 2 policy lab sessions, below is a brief explanation on the policy lab, it's relevance for the topic under consideration, and the role of the Simpson Centre.

WHAT IS A POLICY LAB?

A policy lab is an initiative designed to foster the development, experimentation, and implementation of innovative public policies. It is a collaborative multidisciplinary space where people from different sectors come together to create and test new policy ideas. It uses design thinking, innovation, evidence, and feedback to solve complex issues through ongoing improvement and stakeholder involvement.

It brings together stakeholders—such as crop and livestock producers, researchers, industry experts, government officials, irrigation districts —to co-create solutions to complex societal challenges. Policy labs emphasize experimentation, participation, and iteration to explore and test ideas before implementation.

Policy labs operate at multiple levels: delivering new policy solutions, building capacity among policy professionals, and inspiring new thinking through research and experimentation. They are grounded in people-centered approaches, drawing on diverse perspectives to tackle complexity and build consensus (Policy Lab UK, 2024; MIT Policy Lab, 2024).

WHAT IS THE SIMPSON CENTRE'S POLICY LAB ABOUT?

Water sustainability in Alberta's agriculture is a complex, multi-stakeholder issue involving environmental, economic, and technological dimensions. The increasing pressure from climate variability, water scarcity, and the need for efficient resource use demands innovative approaches. A policy lab provides a structured yet flexible environment where producers, researchers, industry experts, government officials, irrigation districts, and other stakeholders can collaboratively explore how digital tools—such as precision irrigation, remote sensing, and data analytics—can be leveraged to optimize water use, protect ecosystems, and support agricultural productivity.

To address Alberta's water availability challenges in agriculture, this policy lab will create a roadmap for improving water sustainability in agriculture through digitalization. Crop and livestock producers, researchers, industry experts, government officials, irrigation districts, and other relevant stakeholders will collaborate to develop a plan to optimize water use, protect the environment, and support business growth.

The Simpson Centre for Food and Agricultural Policy at the University of Calgary plays a pivotal role in convening stakeholders and facilitating evidence-based dialogue on agricultural policy. Through initiatives like this Policy Lab, the Simpson Centre aims to foster inclusive engagement and co-creation of actionable strategies that reflect both scientific insight and the lived experiences of Alberta's agricultural community.

Below is a preliminary summary of the discussions from the first two policy lab sessions.

POLICY LAB 1: WATER SUSTAINABILITY IN ALBERTA'S AGRICULTURE THROUGH DIGITALIZATION

CHALLENGES

Session 1 (November 27th, 2024 - Completed): In the first session, we worked to define the problem, identifying key challenges in water sustainability within Alberta's agricultural landscape.

Participants: We had a total of 18 participants that included agricultural stakeholders such as producers and producer associations, agricultural funding organizations, service providers, policymakers, and academic researchers.

Through an online pre-survey, the following 11 challenges in water sustainability efforts in Alberta's agriculture were identified:

1. Extreme Events (e.g., drought, flood, wildfires, etc.)
2. Water Allocation (increase in demand for water, decrease in total water availability)
3. Regulation (water licenses)
4. Efficiency (water loss due to ageing infrastructure)
5. Reuse (water reclamation, treatment, reuse for purposes such as agriculture, industrial processes, etc.)
6. Safety (water quality)
7. Infrastructure deficits/deficiencies (solving for existing infrastructure doesn't bring water to where it's needed for agriculture use / economic growth)
8. Storage and peak flow
9. Maintenance of ecological services
10. Tile drainage

The Policy Lab participants voted to discuss the following six challenges given their relevance. In the first part of the session, participants gathered in small groups to share their thoughts on the challenges and then placed them on post it notes based on the following prompts:

1. **What:** Description of the task and the activity
2. **Who:** Description of the people involved, the stakeholders, the players
3. **Where:** Description of the site
4. **When:** Description of time, duration, and frequency
5. **How:** Description of the method, operating procedures, and protocols
6. **How Many:** Description of the means, materials, and human resources
7. **Why:** Description of reasons, causes, objectives

Below are key points that were raised:

Storage and Peak Flow (11 votes)

The discussion around the challenge of storage and peak flow in Alberta's agriculture revolved around the mismatch between water availability and agricultural demand. Spring rains and snowpack contribute significantly to water supply, but this often occurs at times that do not align with crop needs, leading to inefficiencies and water loss through evaporation and diversion. Natural features such as wetlands and upstream reservoirs play a crucial role in managing water availability. As per the participants, relevant stakeholders include farmers, ecosystems, municipalities, and the Government of Alberta. Recommendations emphasized the development of diverse storage systems (small on farm + large collective), improved forecasting and flow metering, satellite monitoring, enhancing allocation systems to match seasonal demand, and compensation for landowners who support natural storage solutions and rewilding.

Efficiency (9 votes)

Efficiency in water use was seen as a challenge due to limited water availability and growing demand. Cultural expectations, outdated infrastructure, and economic pressures were listed as reasons behind inefficiencies. Maximizing water use per drop was seen as important for sustainability and economic viability. Some suggestions to improve efficiency included widespread adoption of no-till practices and to use wetlands described as "*sponges on landscape*" to improve soil health and water retention. Relevant stakeholders listed ranged from farmers and ranchers to regulators, irrigation districts, NGOs (e.g., Ducks Unlimited, ALUS), and every Albertan. Recommendations included promoting precision agriculture, conservation cropping, financial incentives, collaborative planning, and block pricing for municipal water use.

Infrastructure Deficits/Deficiencies (7 votes)

Infrastructure deficits/deficiencies were seen as a barrier to effective water management in Alberta. Much of the existing infrastructure is outdated and unable to meet current or future water needs. There is a geographical mismatch between water supply and user location, with most of the supply in the north and users in the south. The challenge is compounded by long timelines and high costs for upgrades. Responding to why we need to improve infrastructure, one participant highlighted a "*projected increase of 200% in infrastructure demand*" and the inability to deliver water when crops need it. Key stakeholders mentioned included agricultural producers, irrigation districts, municipalities, First Nations[3], and all levels of government. Recommendations focused on conducting basin water holding capacity studies, implementing cost-share agreements for upgrades, identifying strategic investment nodes, and integrating data and simulation tools for proactive planning.

Water Allocation (6 votes)

Participants discussed how water allocation in Alberta is governed by complex systems including international agreements, licensing, and entitlements. Equity and representation were listed as concerns, particularly regarding Indigenous communities and ecosystem needs. The First in Time First in Right (FITFIR) system, while functional, was seen as outdated and controversial. Participants raised important points including the scarcity of allocations in the South Saskatchewan River Basin (SSRB) and the ethical question of "*who speaks for the water*." Relevant stakeholders mentioned included farmers, ranchers, regulators and policy makers, Indigenous

[3] Both terms - First Nations, Indigenous Communities - were used by participants

communities, and environmental advocates. Recommendations called for transparent and dynamic allocation systems, the re-evaluation of FITFIR and exploration of alternative models, the inclusion of diverse voices, rewarding conservation behaviors, and publicizing water agreements.

Maintenance of Ecological Services (5 votes)

Maintaining ecological services was seen as important for sustainable agriculture in Alberta. These services, such as pollination and runoff management, exist naturally within ecosystems but are maintained by private landowners for public benefits. The challenge lies in balancing agricultural yield with ecological sustainability. There were suggestions for "*bringing back the beavers*" and the use of flow gauges to monitor natural regimes. Relevant stakeholders mentioned included farmers, ranchers, government agencies, First Nations, ecosystems, and society at large. Recommendations included financial incentives for beneficial practices, monitoring technologies, compensation for ecosystem service maintenance, and protection of riparian zones and wetlands.

Extreme Events (4 votes)

Extreme weather events, including floods, droughts, and heat domes, were discussed as becoming more frequent and severe in Alberta, posing significant risks to agriculture and infrastructure. Reasons suggested for extreme events included being driven by climate change and complex feedback systems, speculative causes such as sun cycles and humorous mentions such as "*Ask ChatGPT.*" Relevant stakeholders affected include farmers, ranchers, government bodies, wildlife and ecosystems, and consumers (via price impacts). Recommendations emphasized investment in adaptation infrastructure, insurance mechanisms, innovative solutions like cloud seeding, and improved forecasting and planning for localized impacts.

DIGITAL AGRICULTURE IMPLICATIONS

Though not the focus of the discussion, participants implicitly and explicitly referenced digital tools and technologies that could support water sustainability in Alberta's agriculture. Below is a summary of how participants envisioned the role of digital tools across the six challenges:

1. Storage and Peak Flow

Participants emphasized the need for monitoring and forecasting tools such as satellite monitoring to track water use and availability. Supply forecasting and flow metering were highlighted as essential for managing peak flow and storage efficiency. These tools would help align water availability with agricultural demand, especially during unpredictable spring rains.

Digital Tools:

- Remote sensing (e.g., satellite imagery)
- Real-time flow sensors and telemetry
- Predictive analytics for water supply and demand

2. Efficiency

Discussion of efficiency had the most direct references to digital agriculture with precision agriculture being mentioned as a strategy for improving water use efficiency. Participants noted the importance of technology and data-driven decision-making to optimize irrigation and reduce waste.

Digital Tools:

- IoT-enabled irrigation systems
- Soil moisture sensors
- GIS and remote sensing for crop water needs
- Smart meters and municipal water analytics

3. Infrastructure Deficits/Deficiencies

While not always explicit, participants called for data collection, integration, and simulation to identify infrastructure gaps and plan upgrades. This suggests a role for digital modeling tools, decision support systems, and infrastructure monitoring platforms.

Digital Tools:

- Digital twins of water infrastructure
- Basin-scale hydrological modeling
- Asset management software for infrastructure planning

4. Water Allocation

Participants discussed the need for monitoring and evaluation systems to track water use and enforce allocations. There were also calls for transparency and public access to agreements suggesting a role for digital registries or blockchain-based water markets.

Digital Tools:

- Water licensing and allocation platforms
- Real-time usage dashboards
- Public databases for water rights and trades

5. Maintenance of Ecological Services

Participants emphasized the need to monitor ecological flows using satellites and Unmanned Aerial Vehicles (UAVs). Participants also mentioned that understanding natural regimes and post-irrigation changes requires environmental monitoring systems.

Digital Tools:

- UAVs for habitat and vegetation monitoring
- Satellite-based ecological indicators
- Biodiversity and soil health tracking apps

6. Extreme Events

Though less specific, participants mentioned the need for prediction tools and adaptation strategies. "Ask ChatGPT" was humorously noted, but it reflects openness to AI-based forecasting and decision support. References to cloud seeding and climatic feedback imply a need for climate modeling tools.

Digital Tools:

- AI-driven weather and drought forecasting
- Risk assessment models
- Early warning systems for floods and droughts

Although the focus of this session was to elaborate on challenges in water sustainability in Alberta's agriculture, references to digital tools that could be used to tackle the challenges highlight an awareness among participants of the value digital tools can bring to agricultural water management. Digital technologies can be seen as integral to building a resilient and sustainable agricultural system in Alberta.

SUMMARY OF DIGITAL TOOL OPPORTUNITIES FOR CHALLENGES

Challenge	Digital Tools Mentioned or Implied
Storage & Peak Flow	Satellite monitoring, flow metering, forecasting tools
Efficiency	Precision agriculture, smart irrigation, municipal water analytics
Infrastructure Deficits	Data integration, simulation, digital twins
Water Allocation	Monitoring systems, digital registries, transparent allocation tools
Ecological Services	UAVs, satellite monitoring, ecological flow tracking
Extreme Events	AI forecasting, climate models, early warning systems

CHALLENGES: URGENCY VS EFFORT

Following the discussion on challenges in water sustainability efforts in Alberta's agriculture, participants came together to discuss their perceived urgency and effort. Urgency was understood in terms of how soon the challenges need to be dealt with. Effort was described in terms of the number of resources needed to deal with the challenges. Below is a summary of the discussion for each challenge with supporting quotes from participants. The challenges are listed in the order they were discussed.

Water Allocation

The discussion on water allocation revealed a complex and often contentious issue. Participants generally rated it as low urgency but requiring high effort, largely due to its political sensitivity and the need for inclusive consultation. One participant argued, *"Most of the province can still apply for and receive a license,"* suggesting that the system is functional, though others disagreed. Another participant emphasized political challenges, stating, *"It's highly political, anything political is hard. Time is money, so, hours in a room adds up."* The discussion highlighted tensions between agricultural water rights, urban use, and ecological needs, with calls for reform, education, and broader stakeholder engagement.

Extreme Events

Extreme events were rated as high urgency and high effort. One participant noted, *"One in 100-year extreme weather events are happening more and more frequently,"* underscoring the growing threat of climate change. Another added, *"Extreme events are really an outcome of management… we have to start looking at it in a proactive way."* The group agreed that while the events themselves cannot be controlled, proactive adaptation and mitigation strategies are essential. One participant shared practical examples from ranching, saying, *"We have been collecting rainwater so that we can water cattle… making sure that the stubble is [higher] so that it traps more snow."* The discussion emphasized the need for infrastructure, planning, and behavioral change to address extreme events effectively.

Efficiency

Efficiency was viewed with medium urgency and moderate to high effort. One participant argued, *"If we are able to make more from what we have then we might be able to get excess or surplus,"* stressing the importance of conservation. Another participant countered that, *"We have improved efficiency so much… the remaining gains are smaller and less important."* One participant noted the importance of shooting *"at the right target."* The group acknowledged past successes in agricultural efficiency but debated whether further improvements would yield significant benefits. There was consensus that urban water use and public education on water availability and use should be prioritized, and that private sector innovation could play a key role in future efficiency gains.

Maintenance of Ecological Services

Maintaining ecological services in agricultural landscapes was rated as high urgency and high effort. One participant stated, *"These [ecosystems] have already been lost, so we need to maintain them now,"* highlighting the degradation of natural systems. Another participant explained, *"Wetlands act as sponges on the landscape… they absorb runoff and retain water,"* illustrating their agricultural and ecological value. Emphasizing the lack of market mechanisms, one participant stated, *"The markets for ecological services for the past 20 years are non-existent."* Participants discussed the difficulty of quantifying ecological goods and services, the need for restoration, and the importance of compensating landowners. The conversation reflected a shared understanding of the value of ecological services and the challenges in integrating them into policy and practice.

Storage and Peak Flow

Storage and peak flow were considered high urgency and high effort. One participant argued, *"We need a system that can manage the problem… capture the excesses and distribute it in times of droughts."* Another participant supported this with data, noting, *"Last year, we transmitted 58% [water] across the boundary, instead of the 50% we had to."* Introducing the concept of tile drainage, one participant explained, *"You can close the levers and store water on the landscape… not just a drain, but also to retain."* The group agreed that infrastructure is critical to managing Alberta's water variability and that investment in storage systems is essential for long-term resilience. This tied in with the discussion on infrastructure.

Infrastructure Deficits/Deficiencies

Infrastructure deficits were split into existing and future needs. One participant clarified, *"Pipeline breakage in St Mary's or in Calgary—that is [a] deficit,"* distinguishing it from storage. Another participant noted, *"We are 63% pipeline now… the bulk of it has already been established,"* suggesting progress but also room for improvement. Highlighting broader concerns, one participant stated, *"There is a huge deficit in the funding of municipalities… [and] counties to maintain ditches, roadways."* The group discussed the need for federal support, expansion beyond irrigation, and the importance of planning for future infrastructure to support ecological services and water management.

DIGITAL AGRICULTURE IMPLICATIONS

While the term "digital tools" was not frequently used explicitly, several comments pointed to the need for data, modeling, quantification, and innovation, which are often enabled by digital technologies. Below are some key insights:

1. Efficiency and Technological Innovation

Participants acknowledged that while much progress has been made in agricultural water efficiency, further gains would require advanced technologies and research. One participant noted that *"The work on efficiency that we need to do now is more on the research and development side, [such as] find[ing] more technologies to make us more efficient to push to that next level."* This suggests a role for precision agriculture, sensor-based irrigation, and data-driven decision-making to optimize water use.

2. Quantification of Ecological Goods and Services

A major barrier to integrating ecological services into policy and markets was the lack of quantification tools. One participant asked *"Are we looking for quantification for [ecological services]? We are talking about markets, all these things … how does one even quantify it?"* Another participant responded that *"Just like [an ecological] service is sequestering so much carbon, but they haven't got the systems in place to quantify that…"* Giving an example of a project that quantifies ecological services, one participant added that *"We have projects that do exactly that. How much water is kept on the land if you leave it in a wetland? How much is the water quality?"* These comments point to the need for digital monitoring systems, remote sensing, and modeling tools to measure and value ecological services.

3. Data and Modeling for Infrastructure Planning

While not elaborated on in detail, there was an implicit recognition that data integration and simulation are essential for planning infrastructure and managing water flows. For example, in the context of storage and peak flow, one participant described that *"Tile drainage doesn't just remove water in peak flow; you can close the levers and store water on the landscape… you can use that to manage your water table below your rooting*

zones." This kind of system would benefit from digital control systems, field-level sensors, and hydrological modeling to optimize performance.

4. Public Education and Behavior Change

One participant emphasized the need for public education on water use and efficiency, especially in urban areas stating that *"We have a real disconnect between our urban cousins and others… Canadians waste more water than any other country in the world… it is a priority for us to educate our urban cousins on what is the real value of water."* While not explicitly digital, this opens the door for digital outreach tools, apps, and interactive platforms to raise awareness and influence behavior.

SUMMARY OF DIGITAL TOOL OPPORTUNITIES

Challenge Area	Digital Tool Implication
Efficiency	Precision agriculture, R&D, smart irrigation, data analytics
Ecological Services	Quantification tools, remote sensing, ecological modeling
Storage & Peak Flow	Digital control systems, hydrological modeling
Infrastructure Planning	Simulation tools, GIS, asset management platforms
Public Engagement	Digital education, apps, behavior tracking

POLICY LAB 2: WATER SUSTAINABILITY IN ALBERTA'S AGRICULTURE THROUGH DIGITALIZATION

Session 2 (March 4th, 2025 - Completed): In the second session, we focused on producers' needs, challenges, and opportunities when it comes to leveraging digital tools to enhance water sustainability in Alberta's agriculture; and discussions focused on identifying key areas for policy interventions.

Participants: We had a total of 20 participants that included agricultural stakeholders such as producers and producer associations, agricultural funding organizations, service providers, policymakers, and academic researchers.

OECD PRINCIPLES ON WATER GOVERNANCE

Operationalizing the **OECD Principles on Water Governance** (2015), participants discussed the following questions:

1. Within the context of Alberta, water sustainability, and digitalization in agriculture, which of these principles are most relevant and why – particularly for producers?
2. How might we work towards implementing them in the Albertan context?
3. Rank them based on URGENCY and EFFORT

Before summarizing the discussions during the policy lab 2 session, below is an excerpt from the OECD report that outlines the 12 OECD Principles on Water Governance (for reference):

Coping with current and future challenges requires robust public policies, targeting measurable objectives in pre-determined time-schedules at the appropriate scale, relying on a clear assignment of duties across responsible authorities and subject to regular monitoring and evaluation.

Water governance can greatly contribute to the design and implementation of such policies, in a shared responsibility across levels of government, civil society, business and the broader range of stakeholders who have an important role to play alongside policy-makers to reap the economic, social and environmental benefits of good water governance.

The OECD Principles on Water Governance intend to contribute to tangible and outcome-oriented public policies, based on three mutually reinforcing and complementary dimensions of water governance: (p3)

- **Effectiveness** relates to the contribution of governance to define clear sustainable water policy goals and targets at all levels of government, to implement those policy goals, and to meet expected targets. (p3)

Principle 1. Clearly allocate and distinguish *roles and responsibilities* for water policymaking, policy implementation, operational management and regulation, and foster co-ordination across these responsible authorities.

Principle 2. Manage water at the *appropriate scale(s)* within integrated basin governance systems to reflect local conditions, and foster co-ordination between the different scales.

Principle 3. Encourage *policy coherence* through effective cross-sectoral co-ordination, especially between policies for water and the environment, health, energy, agriculture, industry, spatial planning and land use

Principle 4. Adapt the level of *capacity* of responsible authorities to the complexity of water challenges to be met, and to the set of competencies required to carry out their duties (pp9-12)

- **Efficiency** relates to the contribution of governance to maximize the benefits of sustainable water management and welfare at the least cost to society. (p3)

Principle 5. Produce, update, and share timely, consistent, comparable and policy-relevant water and water-related *data and information*, and use it to guide, assess and improve water policy

Principle 6. Ensure that governance arrangements help mobilize water *finance* and allocate financial resources in an efficient, transparent and timely manner

Principle 7. Ensure that sound water management *regulatory frameworks* are effectively implemented and enforced in pursuit of the public interest

Principle 8. Promote the adoption and implementation of *innovative water governance* practices across responsible authorities, levels of government and relevant stakeholders (pp9-12)

- **Trust and Engagement** relate to the contribution of governance to building public confidence and ensuring inclusiveness of stakeholders through democratic legitimacy and fairness for society at large. (p3)

Principle 9. Mainstream *integrity and transparency* practices across water policies, water institutions and water governance frameworks for greater accountability and trust in decision-making

Principle 10. Promote *stakeholder engagement* for informed and outcome-oriented contributions to water policy design and implementation

Principle 11. Encourage water governance frameworks that help manage *trade-offs* across water users, rural and urban areas, and generations

Principle 12. Promote regular *monitoring and evaluation* of water policy and governance where appropriate, share the results with the public and make adjustments when needed (pp9-12)

The OECD Principles on Water Governance are developed on the premise that there is no one-size-fits-all solution to water challenges worldwide, but a menu of options building on the diversity of legal, administrative and organizational systems within and across countries. They recognize that governance is highly contextual, that water policies need to be tailored to different water resources and places, and that governance responses have to adapt to changing circumstances. (p5)

EFFICIENCY	EFFECTIVENESS	TRUST & MANAGEMENT
1. Financing	5. Roles & Responsibilities	9. Transparency
2. Regulatory Frameworks	6. Appropriate Scales	10. Stakeholder Engagement
3. Data & Information	7. Policy Coherence	11. Trade-offs among users
4. Innovative Governance	8. Capacity	12. Monitoring & Evaluation

POLICY INTERVENTIONS TO PROMOTE WATER SUSTAINABILITY IN ALBERTA'S AGRICULTURE THROUGH DIGITALIZATION

Below is a summary of the discussions held among four focus groups regarding the OECD Water Governance Principles. The summary includes the key themes with direct quotes as supporting evidence, outlines the implementation strategies recommended by participants, and consolidates how participants ranked the principles.

EFFICIENCY

FINANCING

Financing was discussed as both a barrier and an enabler. Participants noted that while funding exists, it is often hard to access, overly bureaucratic, or insufficient for infrastructure and innovation. One participant noted that "*Financing is always an obstacle for farmers*." Financing was also discussed in terms of scale where a small versus large-scale farmer would consider different amounts of money as risky. For instance, one participant noted how for "*a small farmer, $5,000 is a lot of money and a lot of risk*." The need to provide matching funding was also considered a barrier as opposed to being provided with tools for free to encourage more uptake of the tool from farmers. Oversubscription of financing programs was seen as a barrier as sometimes that may lead to a shortfall in funding availability.

REGULATORY FRAMEWORKS

Participants generally agreed that Alberta's regulatory frameworks are functional but slow to adapt. There was concern about the time and complexity involved in making regulatory changes, especially for infrastructure and inter-basin transfers. Highlighting the existence of interprovincial water transfer agreements, one participant stated that "*The licensing system needs to be changed… Alberta's water is not Alberta's alone to decide. And a lot of people don't realize that*." Reiterating that current frameworks work, one participant noted that "*From my perspective, the regulatory frameworks … are really not bad*."

DATA AND INFORMATION

All groups identified data as critical for digitalization, decision-making, and accountability. However, they also highlighted gaps in data availability, integration, and granularity. Noting the urgency, one participant stated that "*I would say the urgency for data is high. I would actually put the level of effort as medium*." In contrast, noting its significance as a starting point, another participant mentioned that "*it has to start from somewhere. So, data and information [are] vital*." Since different groups are "*all collecting slightly different bits of information*" and in different forms, one participant raised the point that this could be "*an opportunity to convene different bodies*" to collate information under one platform. The gaps in data availability were also discussed as a cause for concern with one participant mentioning that "*they know how much water flows out of there, or how much [is] diverted from the river. We don't know where water goes after that. We can only estimate how much is used for irrigation or municipalities. There's some more data, but the rest of it, the licensing, is not measured and not reported*." Importance of data was also discussed in the context of digitalization since AI can leverage large quantities of data.

INNOVATIVE GOVERNANCE

Innovation was discussed in terms of both governance structures and technology adoption. While some participants saw innovation as emerging organically, others emphasized the need for investment and experimentation. One participant emphasized the need for innovative governance to maximize the utilization of currently available water "*because we do have a large volume of water…. If we could just hold all of our water, reuse all of our water, and […] be more efficient with our actual water, I think we'd […] have a lot less water shortages than we actually have*." Citing the use of solar panels on irrigation canals in India as an example of innovative governance, one participant questioned "*if you can make it work in India, how come we can't make it work here in Alberta?*"

EFFECTIVENESS

ROLES AND RESPONSIBILITIES

Clearly distinguishing roles and responsibilities was considered straight-forward in most contexts and therefore was not identified as a priority concern. However, participants noted that effort may be needed for the coordination aspect of roles and responsibilities. For instance, as one participant remarked: "*the distinguishing part, I think, is easy. Low effort. Every political party does that. The coordination is the tough challenge. Just like coordination of data. That's a massive task. […]. It needs more effort.*"

APPROPRIATE SCALES

Delineating appropriate scales was consistently emphasized across all groups as foundational to effective water governance. Participants stressed the need to manage water at the right scale—whether that be at the basin level, district level, or farm level. One participant remarked, "*there's no one-size-fits-all water approach for you know, half of the continent. So, me using appropriate scales [is] really important*." Citing the example of EU, another participant said that "*one thing that really worked well in the EU is that you would be managing basins and looking at [trans-boundary policies]. I think we could do more of that*"

POLICY COHERENCE

Participants across groups highlighted the lack of coordination between sectors and jurisdictions, especially between agriculture, environment, and municipal planning. This was evident through remarks such as "*a lot of those sectors don't talk to each other around water*" and "*we're not very coherent or not talking among stakeholders*." Given the complexity of policy coherence, one participant noted that "*when you have silos within different departments […] then you come up against barriers*."

CAPACITY

Capacity was discussed in terms of institutional ability to monitor, enforce, and adapt governance. While not always seen as urgent, it was consistently rated as high effort given that the level of capacity leaves much to be desired. For example, one participant noted that "*the level of capacity just isn't there because it's the wrong people in charge of the wrong decisions*." Another noted "*Capacity to manage all this, to regulate, to enforce—there's next to nothing*." Emphasizing the role of digitalization, one participant remarked that "*you need people with that knowledge, […] maybe armed with some of these digital tools*."

TRUST & MANAGEMENT

TRANSPARENCY

Trust in water governance was a recurring concern. Participants discussed the need for open data, clear communication, and inclusive decision-making. One participant noted a "*massive trust issue*" between (1) "*on-the-ground practitioners, everyday people and academics*" (2) "*government officials and everyday people*" and (3) trust issues within the decision-making system itself raising concerns about "*whether or not the system represents the everyday people because of how old it is and the fact that it's never really been revised properly. It constantly seems to get revised in a closed-door process, a black-box process. It's not open.*" Transparency requires honesty, which takes substantial effort, but as one participant remarked, "*it's just not being done*." One participant suggested that a district could be seen as a trusted intermediary for stakeholder engagement to enhance trust.

STAKEHOLDER ENGAGEMENT

All groups emphasized the importance of engaging producers and other stakeholders in water governance with bottom-up approaches being preferred. For instance, one participant emphasized the need to engage producers and "*let them tell you what they need […] instead of you sitting in your office and creating something for them that they might not actually need*." Another participant discussed the importance of "*incorporating […] indigenous worldview[s] into water [to] help us shift our thinking.*"

TRADE-OFFS ACROSS USERS

Trade-offs across users was discussed in the context of water allocation between agriculture, municipalities, and industry. Participants emphasized the need to consider the full value chain and economic impacts with one participant noting that "*it's not just your farmers, [it's] the whole value chain.*"

MONITORING AND EVALUATION

Monitoring and evaluation were often discussed alongside data and information. Participants emphasized the need for regular evaluation of water use and policy effectiveness with one participant suggesting that "*It should just be reviewed every five years*." Monitoring and evaluation were also seen as relevant to avoid the continuation of "*outdated policy from 1909 or the late 1800s*." Discussing how monitoring and evaluation might be done, one participant remarked that "*you need to be able to say, okay, […] this is where we are at now, and this is where we want to go. Or […] we've implemented X, Y and Z, and now we are better or worse than before.*"

IMPLEMENTATION STRATEGIES

Participants proposed several strategies for implementing the most relevant principles in Alberta's context:

1. Define appropriate scales first
2. Develop shared data infrastructure
3. Simplify access to financing
4. Build institutional capacity
5. Foster cross-sector coordination
6. Promote inclusive stakeholder engagement
7. Modernize regulatory frameworks
8. Encourage innovation through pilots and partnerships
9. Improve transparency and trust
10. Regular monitoring and evaluation

SNAPSHOT OF PRINCIPLES BY URGENCY AND EFFORT

Principle	Urgency vs Effort
P1: Financing	Infrastructure and innovation require major investment.
P2: Regulatory Frameworks	Functional but slow to adapt.
P3: Data and Information	Critical for digitalization; current systems are inconsistent.
P4: Innovative Governance	Happens organically; needs support.
P5: Roles and Responsibilities	Clear in most contexts; not a concern.
P6: Appropriate Scales	Foundational; moderate effort to implement.
P7: Policy Coherence	Cross-sector coordination is lacking.
P8: Capacity	Institutional capacity is limited; not yet a crisis.
P9: Integrity and Transparency	Important for trust; not always practiced.
P10: Stakeholder Engagement	Trust-building and inclusion are essential.
P11: Trade-offs Across Users	Recognized but not prioritized.
P12: Monitoring and Evaluatio	Tied to data and policy updates.

HOW CAN DIGITAL TOOLS SUPPORT WATER GOVERNANCE IN AGRICULTURE?

1. ENHANCING MEASUREMENT AND MONITORING

Participants across groups emphasized that digital tools could improve the accuracy, granularity, and timeliness of water use data. This was seen as critical for effective governance. One participant stated that "*we always say you can't manage what you don't measure, and you need to have measurements first.*" Emphasizing the need for consistency in data, another participant pointed out that "*It's out there, but [we need to] make sure that it's a consistent data set*." Accessibility and affordability were also highlighted with participants saying that "*With today's technologies, it's a lot more accessible than it's ever been before"* and *"It's getting cheaper. Information keeps catching up to us*."

Extrapolating from this, digital tools, such as flow meters, remote sensing, and automated reporting, could fill critical data gaps and support more transparent and accountable water use.

2. SUPPORTING DECISION-MAKING AT MULTIPLE SCALES

Digital tools were seen as valuable for both farm-level and basin-level decision-making, though participants raised the issue that benefits at the micro level don't always translate to the macro level. For example, one participant said that "*this on farm digitalization, that can make you ultra efficient it's all good. But that's really the micro scale, in a sense, because the macro scale where water efficiency really occurs is [at] the district-level*." Highlighting the existing tools available for decision making, one participant said that "*we actually can manage [water] on a day-to-day basis, hour-to-hour, week-to-week, month-to-month*."

Extrapolating from this, there is a need for integrated digital systems that connect farm-level tools (e.g., soil moisture sensors, smart pivots) with district-level planning and water allocation systems.

3. ENABLING INNOVATION AND AI APPLICATIONS

Participants discussed the potential for digital tools to support innovation, including AI-driven models for soil and water management since "*data is the future, especially […] with AI… data becomes [a] commodity, and that has a ton of value*."

Digitalization could unlock new efficiencies and predictive capabilities, but only if foundational datasets are developed and shared.

4. REDUCING ADMINISTRATIVE BURDEN AND IMPROVING ACCESS

Participants discussed how digital tools could simplify reporting and compliance, but only if systems are designed with producers in mind. Tools should be made available at low costs to enable producers to test them out. There is also a need to reduce barriers to access financing.

Digital tools must be user-friendly and reduce, not add to, the administrative burden on producers.

5. BUILDING TRUST THROUGH TRANSPARENCY

Digital tools were also seen as a way to build trust in water governance by making data more transparent and accessible. Digital platforms that allow producers to see how their data is used, and allows them to benefit from it, could help address longstanding trust issues.

Participants also emphasized that digitalization must be accompanied by investment in infrastructure, capacity, and governance reform to be effective.

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APPENDIX A

WATER MANAGEMENT POLICY INTERVENTIONS PRIORITIZED BY FARMERS – 2025 FEDERAL ELECTIONS SURVEY

BACKGROUND: In anticipation of the 2025 federal election, Simpson Centre conducted a national survey to identify ballot box issues and the factors that make these issues significant to Canadian farmers and assess how producer priorities align with the current political landscape. The national survey was conducted across all ten provinces from March 26 to April 13, 2025. 979 completed responses were collected, representing 0.52% of 189,874 Canadian farms per the last farm census 2021 (Agriculture and Agri-food Canada, 2021).

"Water Management Policy Interventions Prioritized by Farmers" was included as one of the ballot box issues in the survey given its relevance in the political landscape. Below are excerpts from the "Water Management Policy Interventions Prioritized by Farmers" section of the briefing paper that was published based on the survey results. For detailed survey results, please see: Ohi and Lhermie (2025) Briefing Paper.

EXCERPTS FROM:
Ahmed, O. & Lhermie, G. (2025). Farmers' Priorities at the Ballot Box: Assessing Political Alignment on Trade, Taxation, Labour, and Sustainability ahead of the 2025 Federal Election. *Briefing Paper.* Simpson Centre for Food and Agricultural Policy.

Under the Liberal governments since 2015, environmental policy has been shaped by Canada's commitments under the Paris Agreement and a push toward net-zero emissions by 2050. The Pan-Canadian Framework on Clean Growth and Climate Change (2016) and the Sustainable Canadian Agricultural Partnership (2023–2028) (Sustainable CAP) have emphasized support for clean technologies, soil health, water management, and biodiversity.

The Conservative governments (2006–2015) focused on voluntary environmental practices and economic growth, avoiding carbon pricing in favor of programs like Growing Forward and Growing Forward 2 (Agriculture and Agri-Food Canada, 2009b), which supported Environmental Farm Plans (EFPs), nutrient and water management, and conservation practices.

Ballot Box Issue: Environmental and Climate Priorities of Farmers

As shown in Figure 3, the 979 farmers who responded to the survey were asked to identify their top three environmental and climate-related priorities. Farmers emphasized financial support, conservation, and risk preparedness. The most frequently cited issues were disaster relief for farmers impacted by extreme weather (54.95%) and federal financial support to mitigate climate risks (48.42%), highlighting the urgent need for risk management tools and financial resilience in the face of increasingly volatile climatic conditions.

Soil health (47.5%) and water conservation (26.35%) were closely followed, which, along with regenerative agriculture practices (24.62%), reflect a strong emphasis on land stewardship and environmental conservation. These selections point to a widespread interest in preserving natural resources while maintaining productive capacity.

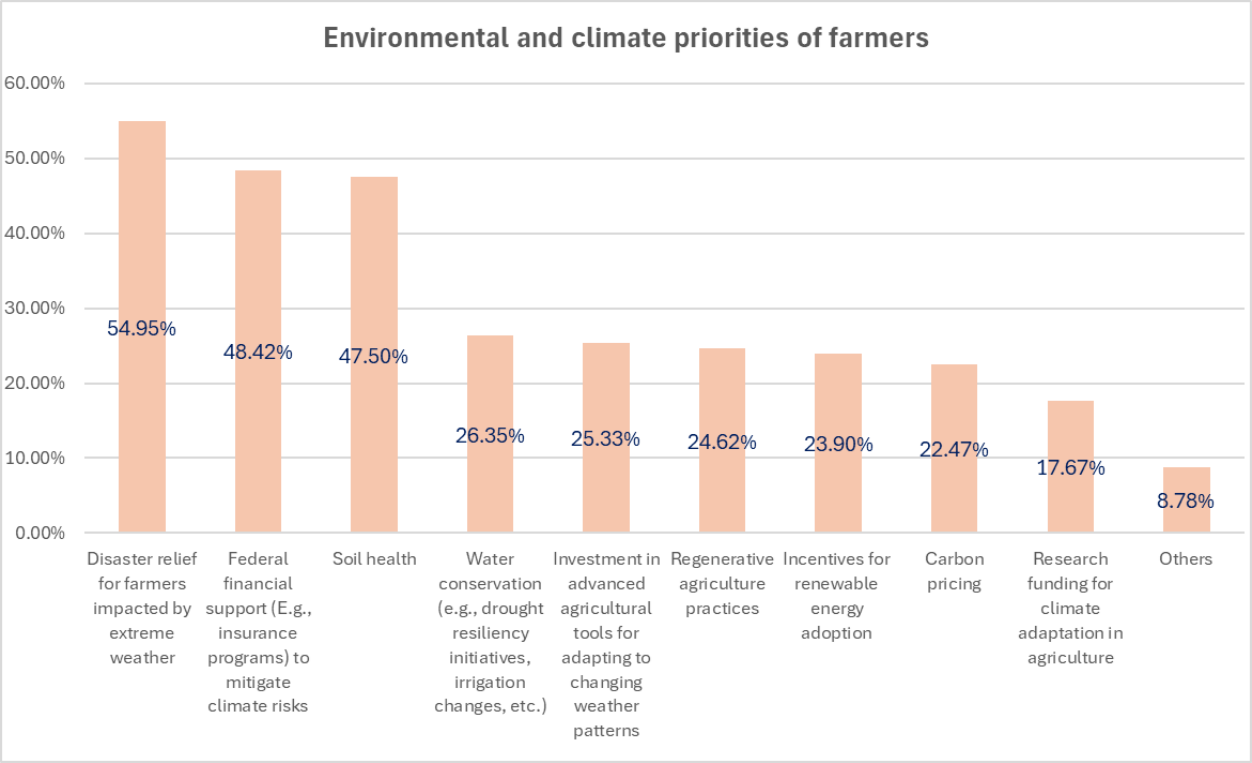

Figure 3. Survey respondents were asked to identify their top three environmental and climate-related priorities.

Ballot Box Issue: Water Management Policy Interventions Prioritized by Farmers

Among farmers who expect the change in water availability to be negative for their farming operations, below are their desired policy interventions concerning Water Management (when asked to pick up to 3 options) as shown in Figure 4:

Among producers expecting water availability to worsen, there is strong support for policy interventions that simplify governance and promote innovation. The most frequently selected priorities were simplifying and harmonizing water regulations across jurisdictions (48.42%) and supporting research and innovation in precision water use technologies (42.88%), indicating a clear desire for regulatory clarity and future-facing solutions.

Investments in smart, technology-driven irrigation systems (28.23%) and integrated weather forecasting tools (28.63%) also ranked highly, emphasizing the value of tech-enabled, adaptive water use. While

financial incentives (20.05%) and public-private partnerships (24.54%) received moderate support, options like education and technical support (13.98%) and data governance frameworks (23.75%) were less emphasized, suggesting that producers currently place higher priority on immediate infrastructure and innovation over capacity-building or regulation.

These preferences call for coherent, innovation-driven, and technology-supported water management policy, grounded in local realities but scalable for broader impact.

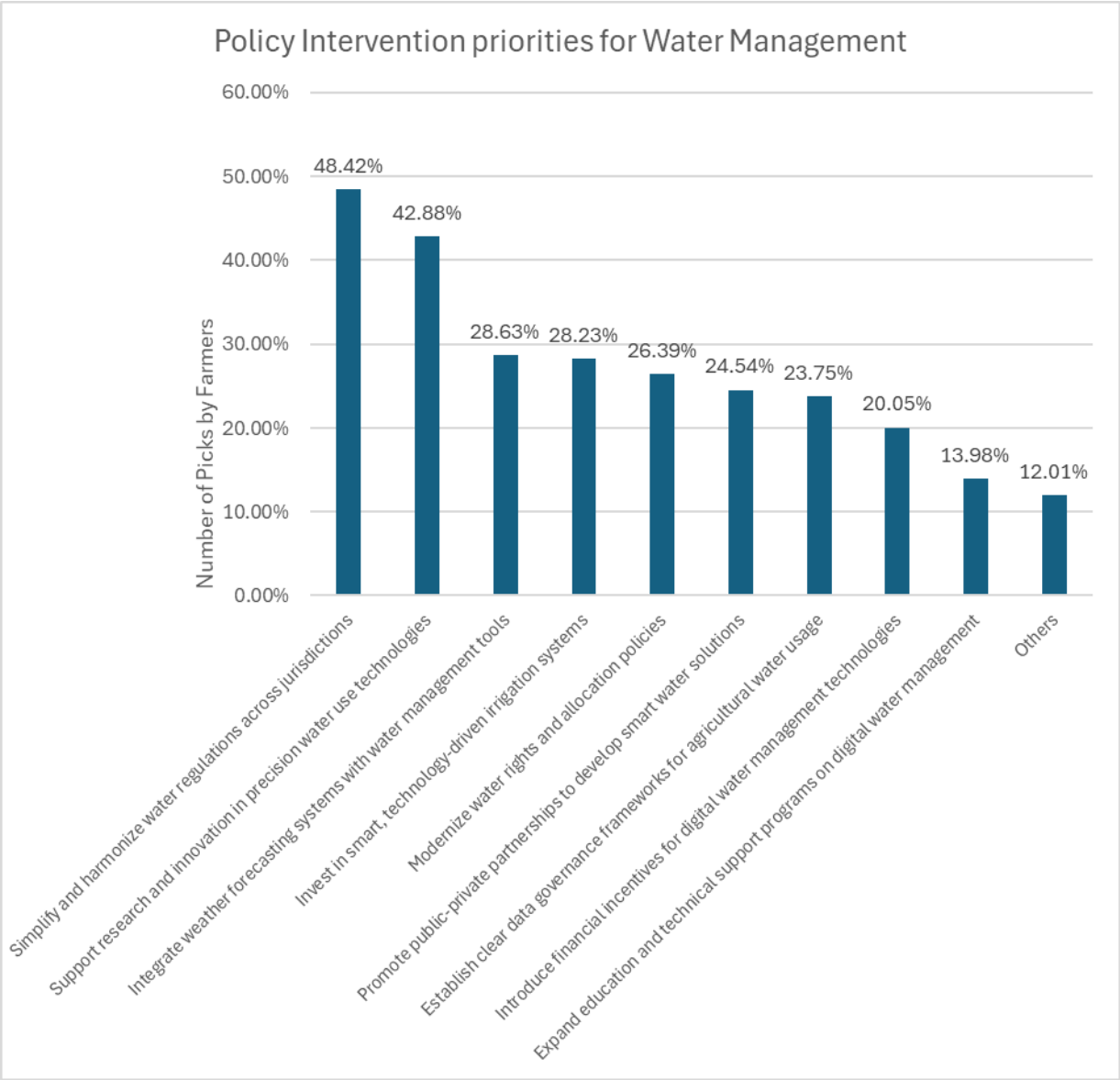

Figure 4. Survey respondents who expected the change in water availability to be negative for their farming operations were asked to identify their top three desired policy interventions.

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