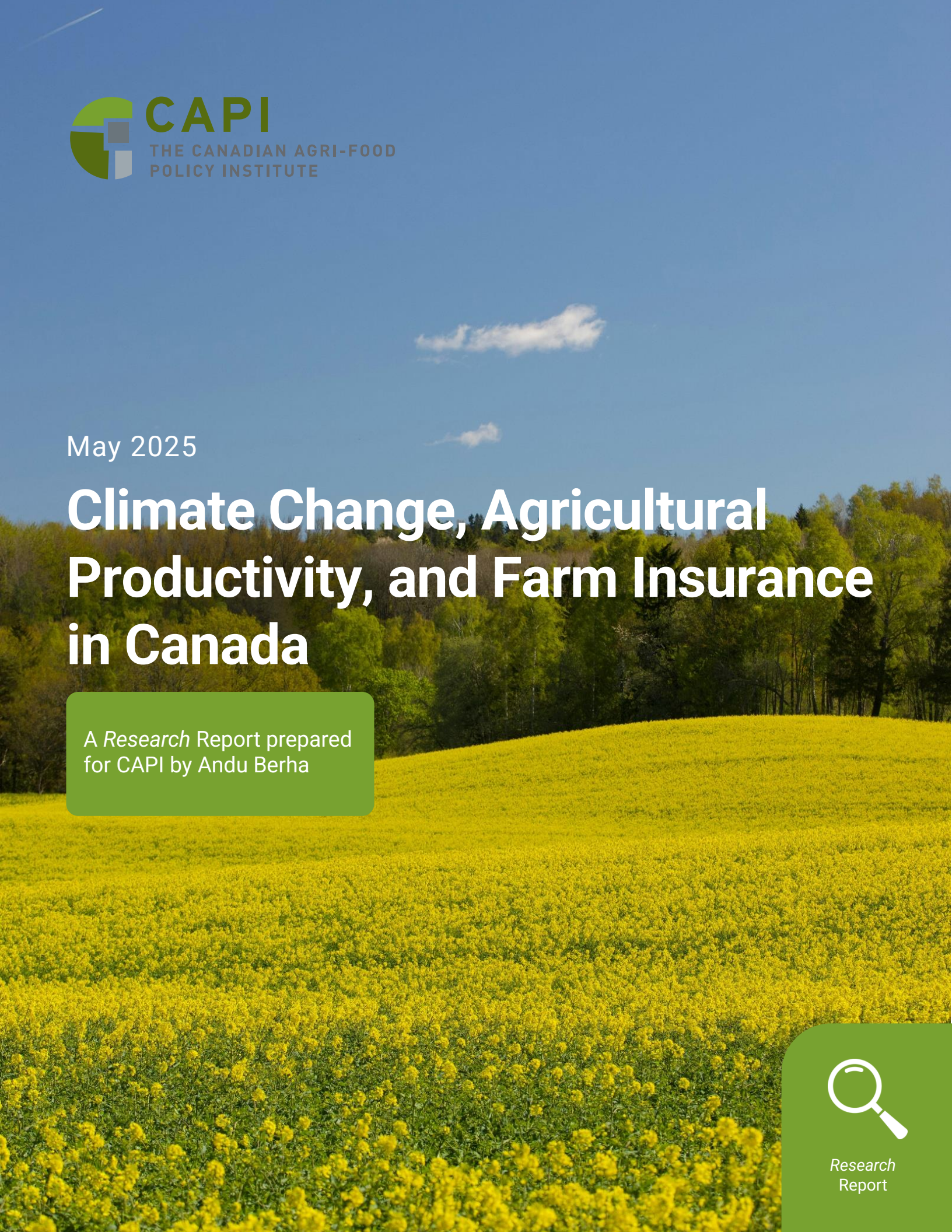


CAPI
THE CANADIAN AGRI-FOOD POLICY INSTITUTE

May 2025

Climate Change, Agricultural Productivity, and Farm Insurance in Canada

A *Research* Report prepared for CAPI by Andu Berha

Research Report

The Canadian Agri-Food Policy Institute
960 Carling Avenue, CEF Building 60
Ottawa, ON K1A 0C6
capi-icpa.ca

The Canadian Agri-Food Policy Institute's mission is to lead policy development, collaborate with partners and advance policy solutions within agriculture and food

This report is supported in part by the RBC Foundation through RBC Tech for Nature as part of CAPI's larger environmental initiative, Spearheading Sustainable Solutions.

CAPI thanks our group of peer reviewers and the Advisory Committee for their feedback on earlier drafts of this report. The findings, interpretations, and conclusions in this report are solely those of its author.

Note from CAPI

CAPI recognizes the importance of fostering and mentoring the next generation of thought leaders emerging from Doctoral programs across Canada, who are working in multi-disciplinary fields. Through CAPI's Doctoral Fellows' program, CAPI offers a small, innovative group of young students the opportunity to apply their knowledge and expertise to some of agriculture's most critical policy issues.

The fourth cohort of CAPI's Doctoral Fellows (2024-2025) was tasked with focusing their research on policies needed to address pressures on Canada's land base and natural resources arising from agricultural production in the face of climate change, biodiversity loss, global population growth and food security concerns. This paper is the final deliverable of the program, showcasing the interdisciplinary nature of the fellows' research as it relates to climate change, agricultural productivity, and farm insurance in Canada.

This Fellowship is supported in part by the RBC Foundation through RBC Tech for Nature as part of CAPI's larger environmental initiative, Policies for Land Use, Agriculture and Nature (PLAN).

CAPI and the Doctoral Fellows would like to acknowledge the contribution of the four members of the Expert Advisory Committee who provided valuable feedback in the preparation of this report – **Dr. Marie-Élise Samson**, University of Laval, **Dr. Tom Nudds**, University of Guelph, **Peter Sykanda**, Ontario Federation of Agriculture, and **Dr. Anatoliy Oginskyy**, Alberta Ministry of Agriculture & Forestry.

Key Takeaways

- **Climate variability is forcing Canadian farmers to adapt their crop choices**. In this study, we show that under stable conditions, most Canadian farms would likely prefer to specialise in a few top-performing crops. However, climate variability is nudging them toward a more "jack-of-all-trades" approach, which generally results in lower output per acre.

- **Crop insurance acts as a buffer against climate shocks**. Our analysis shows that without insurance, farmers hit by climate shocks tend to diversify sharply, redirecting resources away from their most profitable crops, thereby sacrificing productivity. With insurance, these effects are muted: farms with strong insurance support were able to remain more specialised in high-value crops even after adverse weather, and as a result, sustained higher productivity than uninsured or underinsured farms.

- **Rising climate risks are straining farm support programs.** The cost of insurance payouts has surged alongside extreme weather. For example, total direct payments to farmers, driven largely by crop-insurance indemnities, increased from under $1.9 billion in 2018 to nearly $5.7 billion by 2023. This trend underscores the urgency of enhancing resilience: support programs must be efficient and sustainable as claims mount.

- **Tailored, proactive strategies are needed to protect both farm incomes and productivity.** Policy measures should make insurance more accessible and responsive, promote climate-resilient crop choices and farming practices, and address regional differences in risk. By doing so, Canada's farmers can better withstand the impacts of climate change while maintaining the productivity levels needed for food security and economic viability.

Table of Contents

Abstract

Climate variability is compelling Canadian farmers to rethink their crop choices. Our study finds that, under stable conditions, many farmers would concentrate on a handful of top-performing crops; yet rising weather risk is pushing them toward a more “jack-of-all-trades” strategy that typically lowers output per acre. Crop insurance mutes this blow. Without it, producers hit by climate shocks tend to diversify sharply, redirecting resources away from their most profitable crops and sacrificing productivity. With robust insurance, these shifts are far smaller: well-covered farms remain more specialised in high-value crops even after adverse weather, thereby sustaining higher productivity than uninsured or under-insured peers. Protecting both farm incomes and national output will require tailored, proactive policies that widen access to responsive insurance, encourage climate-resilient crops and practices, and recognise regional differences in risk.

Introduction

Farmers across Canada are navigating a changing climate that is reshaping how and when they grow food. Shifting seasons, warmer temperatures, and more frequent extreme weather events are affecting key farming decisions, such as when to seed, how to manage water, and how to protect crops and livestock (AAFC, 2020). Wetter springs may delay planting, while hotter, drier summers can stress both crops like wheat and canola, as well as livestock. Milder winters and longer summers may also influence the spread of pests and diseases. Although longer growing seasons could offer new opportunities, they also amplify uncertainty for farmers adapting to changing conditions. Each season now presents a fresh set of decisions and potential risks.

Faced with increasingly volatile growing conditions, Canadian farmers grapple with two mutually exclusive cropping decisions: specialization and diversification. Under normal conditions, specializing in the most suitable crop for one’s region can maximize efficiency and profits. For instance, a Prairie grain farmer with ideal conditions for spring wheat might devote most of their land to wheat, capitalizing on their comparative advantage in that crop. Specialization allows farmers to focus on the highest-yield or most profitable crop for their land and skills, achieving economies of scale. However, this strategy carries a big downside: if a single disaster (like a drought or pest outbreak) hits that one major crop, the farm’s income can plummet.

The alternative strategy is diversification – planting a portfolio of different crops. By growing a mix (for example, combining cereals, oilseeds, and pulses), a farmer “not puts all their eggs in one basket.” If one crop fails or prices tank, other crops might do better, stabilizing the overall outcome. This logic follows famous portfolio theory from finance: diversifying assets can reduce risk for a given expected return (Markowitz, 1952). Yet this adaptation strategy can also lead to lower aggregate productivity because resources are partially allocated to crops for which the farmer has no clear relative advantage. Thus, climate change not only increases direct crop-

loss risk; it may also nudge farmers away from their most profitable specializations, depressing aggregate productivity (Arbuckle Jr et al., 2015; Zamasiya et al., 2017). Rigorous empirical evidence for these dynamics in Canada, however, is still scant and merits closer investigation.

This study provides new empirical evidence on how climate variability shapes farmers' cropping strategies and, in turn, overall productivity in Canadian agriculture. Specifically, we ask: Are Canadian farmers indeed changing their cropping strategies (specializing versus diversifying) because of increased climate variability? If so, how much this affects their bottom line in terms of productivity? To answer this question, we merged farm data from Census of Agriculture with satellite-derived climate records. The results show that climate shocks, as measured in growing-season temperature and precipitation anomalies, push farmers toward crop diversification, and this shift in turn reduces aggregate productivity, measured by average farm revenue per hectare.

In this regard, well-designed government instruments can play a crucial role in helping farmers manage climate risks without unduly compromising productivity. For decades, Canadian agricultural policy has offered a set of farm support programs under Canada's suite of Business Risk Management (BRM) programs to buffer farmers against income and production shocks. By offering financial protection against production risk, these programs in general and AgriInsurance (crop insurance) in particular, can mitigate the income shortfalls associated with climate shocks. Consequently, insured farmers may be more willing to maintain existing (presumably efficient) production practices, given that they face less downside risk. This theoretical benefit of insurance aligns with conventional wisdom in the field of economics, wherein farmers, being risk-averse agents, place a value on strategies or instruments that reduce income volatility.

Despite the intuitive appeal of crop insurance programs, we have surprisingly limited empirical evidence on how well Canada's farm insurance program (i.e. AgriInsurance) is actually working in the era of climate change. Much of the existing research is limited to case studies or focuses on a few regions, leaving critical questions about the overall effectiveness of this costly program, and its broader implications for sustainable agricultural production, insufficiently explored. To fill this gap, we ask: To what extent does AgriInsurance offset the observed productivity impacts of climate shocks? We link provincial-level indemnity payments to measures of crop diversification and productivity across Canadian regions. The results show that crop insurance indeed enables farmers to maintain their existing cropping strategies amid climate uncertainty, thereby preserving productivity. Our findings shed light on how best to support Canadian farmers as they navigate an increasingly volatile climate and provide insights that can inform the design of more effective, targeted farm-insurance mechanisms for the future.

Background

Specialization, diversification, and climate risk

In theory, under stable conditions farmers will specialise in the crops that yield the highest returns on their land. Classic economic principles of comparative advantage suggest that if, for example, a prairie farm has ideal climate and soil for spring wheat, it should devote most of its resources to growing spring wheat for maximum return (Ricardo, 1817). Specialization allows farmers to take full advantage of their region's potential – soil, climate, and expertise – thereby achieving higher productivity per hectare. However, this strategy becomes risky when conditions are unreliable. Climate variability has been increasing over time; for instance, analyses of Canadian climate data show that year-to-year fluctuations in both growing season temperature and precipitation have trended upward in recent decades, meaning the weather has become less predictable and more prone to extremes (AAFC, 2020).

In a more volatile environment, a farm that specialises too narrowly could be extremely vulnerable – a single drought affecting its main crop could wipe out the entire harvest. Consequently, many farmers turn to diversification as a resilience strategy. By growing a mix of crops, farmers "spread the risk": a drought might ruin one crop but perhaps not all depending on drought resistance capacity, or a disease might affect a specific plant while others remain unscathed. This practice of planting multiple crops as a hedge against uncertainty has been noted historically in Canada (e.g., diversified crop rotations in the Prairies as a buffer against drought years – see

Bradshaw, 2004) and is common worldwide, especially among smallholders facing variable climates (Feliciano, 2019). Diversification can stabilize a farm's output over time, but it often means not concentrating on the absolute best-performing crop, which may lower the farm's average productivity. There is thus an inherent trade-off between risk reduction and efficiency in farming: more diverse cropping can reduce the variance of outcomes (fewer catastrophic losses) but might also reduce the expected output in a normal year.

Table 1. Diversification over time

	(1)	(2)	(3)
	Number of crops per CCS	Number of crops per hectare	Number of crops per farm
Year = 2016	0.384***	0.0002**	0.008***
	(0.085)	(0.0001)	(0.001)
Year = 2021	0.688***	0.0002***	0.030***
	(0.131)	(0.0001)	(0.002)
Observations	3,664	3,664	3,664
R-Squared	0.853	0.790	0.779

Notes: Data sourced from Census of Agriculture (2011, 2016, and 2021). CCS stands for Census Consolidated Subdivision. All regressions include year fixed effects and Census Consolidated Subdivision (CCS) fixed effects. The year 2011 is a reference year. Standard errors are in parenthesis. Significance levels: ***p < 0.01, **p < 0.05, *p < 0.1.

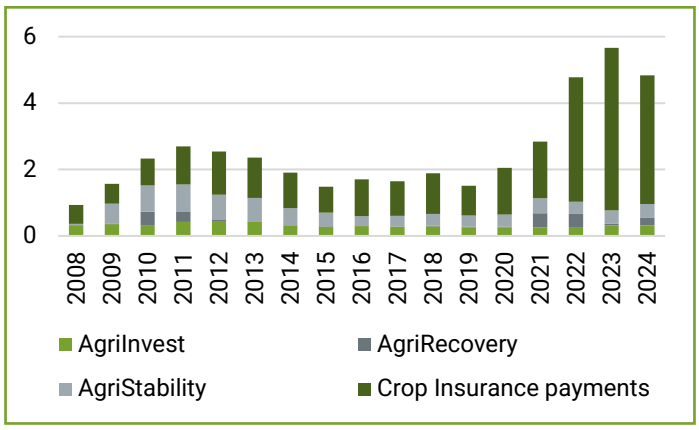
Over the last decade, Canadian farmers have gradually increased crop diversity. Data from the Census of Agriculture indicate that farms are growing a wider array of crops than they did a decade ago. For example, in an average Census Consolidated Subdivision (CCS), the number of different crop types reported increased by about 0.7 from 2011 to 2021 (Table 1, Column (1)). In simpler terms, many grain and oilseed producers have incorporated more pulses or forages, partly to spread weather and market risk. Some diversification may also be driven by emerging market opportunities (e.g., higher demand for crops like soybeans in non-traditional areas) and by environmental considerations (rotating crops can improve soil health). Nonetheless, the timing suggests climate risk is likely to be a major motivator: as weather becomes less reliable, producers hedge their bets by not relying on a single crop.

The role of farm insurance and support programs

Crop insurance is designed to address this very trade-off by transferring some of the risk from the farmer to an insurer (backed by government in Canada's public programs). If a farmer knows that a severe drought will trigger an insurance payout covering a good portion of the losses, that farmer might feel less need to plant a variety of lower-yielding crops "just in case." Instead, they can plant their most productive crop with confidence, and if the worst-case scenario happens, the insurance will compensate them. In effect, insurance can serve as a substitute for on-farm self-insurance strategies like diversification (Just et al., 2003; Yu and Sumner, 2018). Economic research has indeed suggested that generous crop insurance may encourage greater specialization or even riskier crop choices, a behavioural response sometimes referred to as moral hazard. For example, a U.S. study found that subsidized crop insurance influenced farmers' land-use decisions, contributing to more planting of high-value crops and even conversion of grassland to cropland in risky areas (Claassen et al., 2017).

In Canada, the BRM suite, particularly AgriInsurance, provides farmers with a dependable safety net. AgriInsurance is cost-shared by governments and producers and has been a cornerstone of Canadian agricultural policy for decades (Kimura et al., 2020). However, as climate change intensifies, demand for the AgriInsurance program has risen sharply. Insurance payouts have surged in recent years, straining program budgets (Figure 1). In 2021, an extreme drought across Western Canada generated record-high insurance claims (WP, 2024). Nationally, total direct payments to farmers, driven largely by crop-insurance indemnities, increased from under $1.9 billion in 2018 to nearly $5.7 billion by 2023 (Figure 1).

Figure 1. Trend in direct payments (in billion CAD)



Notes: Data sourced from Statistics Canada. Figure produced by the authors.

Methodology

We combine data on farm production, climate variables, and government support programs across multiple regions of Canada. Our primary source for farm-level information is the Canadian Census of Agriculture, which provides detailed farm data at the Census Consolidated Subdivision (CCS) level for the years 2011, 2016, and 2021. For climate information, we used historical weather data from the ERA5 reanalysis dataset (European Copernicus Climate Change Service), which offers high-resolution daily weather estimates going back decades. We also gathered annual figures on direct payment to farmers under Canada's suite of BRM programs at the provincial level from Statistics Canada to serve as a proxy for insurance exposure. We focus on major agricultural regions in the country, including the Prairie Provinces (Alberta, Saskatchewan, Manitoba) and key farming areas in Ontario, Quebec, and British Columbia.

Our first goal is to isolate the cause-and-effect relationships from climate variability to farmer decision towards diversification versus specialization to productivity outcomes.

- *Crop diversification*: To measure crop diversification, we calculated a Shannon index for each CCS-year pair, based on the areas planted to each crop. A low Shannon index (near 0) means the region is dominated by one crop (high specialization), whereas a higher value means land is more evenly split among many crops (high diversification). As a complementary metric, we also computed the share of high-potential crops – essentially the fraction of total crop area devoted to the top one or two crops that historically has the highest yield potential in that region. This share is close to 100% for a very specialised farm and drops as the farm allocates area to other, lower-potential crops.

- *Productivity*: Farm performance is measured by revenue per hectare (gross farm revenue in constant price divided by total farm area), which serves as an aggregate yield/profitability indicator. While not a pure yield measure (since revenue includes non-crop income), it is a broad indicator of how well a farm is performing financially on its land. Granular data on direct productivity measures, such as crop yield, are not available.

- *Climate shocks*: For each growing season and location, we identified instances of severe weather shocks such as extreamly high temperature and low precipitation, among others. Rather than using absolute thresholds (e.g., rainfall below X mm), we defined shocks in a standardized way: for example, a season's temperature or precipitation was considered a shock if it deviated significantly from that location's long-term norm (a high z-score in either direction).

To estimate the productivity effects of diversification that are triggered by climate shocks, we employ a two-stage instrumental-variables (IV) regression. In the first stage, previous year climate shocks serve as instruments that push farms toward higher diversification (or away from specialisation) in the current groing season. In the second stage, it estimate how this shock-induced change in diversification influences revenue per hectare. Essentially, this strategy isolates the question: "If a farm diversifies more because of a climate shock, how much does its productivity change?"

Our second goal is to assess how much Canada's farm-insurance programs cushion the productivity losses caused by climate shocks. For insurance usage, farm-level insurance data are not available (which is confidential), so we used the province-level payout rate (total direct payments as a percentage of farm cash receipts) as an indicator of the insurance support environment. Although this figure also captures payment from other programs such as AgriStability, AgriInvest, and AgriRecovery, crop-insurance indemnities account for the bulk of disbursements (see Figure 1). Using regression analysis, we test whether higher payout rates in previous years encourage producers to stick with higher-return, but risky cropping strategies.

Results

Climate shocks, diversification, and farm productivity

Under stable conditions, many Canadian farms would likely prefer to concentrate on a few top-performing crops, but climate instability is nudging them towards a more jack-of-all-trades approach, which in aggregate produces less output per acre.

Our findings confirm that climate shock-driven diversification significantly reduces productivity. In short, when extreme weather forces farmers to diversify their production, there is a measurable hit to productivity. Using the two-stage statistical approach described, we found that regions experiencing severe climate shocks (e.g. an exceptionally dry or hot growing season) subsequently showed increased diversification – and that this diversification in turn led to lower average revenue per hectare. In the statistical analysis, the effect was captured by a negative coefficient on the diversification index. Specifically, a one-unit increase in the Shannon diversity index (a substantial broadening of crop mix) was associated with roughly a $31 drop in revenue per hectare (Table 2, Column (1)). Similarly, when looking at specialization, we found that a farm that kept 100% of its land in high-potential crops (versus diversifying into other crops) could earn about $65 more per hectare (Table 2, Column (2)). In simpler terms, farms that diversified due to a shock ended up with lower income density on their land than if they had stayed specialised. These estimates were statistically significant, reinforcing the idea that there is a real trade-off: diversification is a good risk-reduction strategy, but it comes at a cost to efficiency.

Table 2. Climate shocks, diversification, and productivity

	(1)	(2)
Dependent variable: Revenue per hectare ($)		
The Shannon diversification index	-30.707*	
	(17.230)	
Share of high-potential crops		64.732**
		(28.858)
First-stage F-statistics	16.85	27.32
Observations	3,662	3,662

Notes: All regressions include year fixed effects and Census Consolidated Subdivision (CCS) fixed effects. The coefficients are estimated using Instrumental Variable (IV) approach, where climate shocks are served as instruments. Standard errors are in parenthesis. Significance levels: ***p < 0.01, **p < 0.05, *p < 0.1. Table created internally.

It's worth noting that these figures (like $31/ha) are averages and may seem modest, but scaled up they can be quite large. For example, a $31/ha reduction on a 1,000 hectare farm translates to $31,000 less revenue in a year, which may determine whether a farm operates at a profit or loss. The intuition behind this result is straightforward – when farmers shift some of their acreage from their best-performing crop into secondary crops (often after a bad experience with a failed main crop), the secondary crops typically yield less profit. A diversified rotation might include lower-value cereals, forage crops, or other products that are essentially "insurance" plantings; they provide some return if the main crop fails, but in a normal year they would not outperform the main crop. Our evidence aligns with this: the climate-shock-induced diversification is "economically inefficient" in the sense that it lowers the farm's maximum potential output. This outcome is consistent with conventional premises and observations in other contexts – farmers sacrifice some upside to protect against the worst-case downside (Kassie et al., 2014; Smit and Skinner, 2002).

Farm insurance as a buffer against shocks

Even when climate shocks strike, crop insurance enables farmers to keep their existing, high-return crop mix instead of switching to a broader, less productive "jack-of-all-trades" portfolio.

We found strong evidence that crop insurance programs moderate the impact of climate shocks on farmer decisions and outcomes. The results suggest that insurance dampens the diversification response. In regions and periods with higher insurance payouts (indicating stronger insurance support), farmers did not diversify as much following a shock, instead largely maintaining their specialization in the main crop. Our regression analysis showed a clear pattern: a higher insurance payout rate in previous growing season was associated with a significantly lower Shannon diversification index and a higher share of land in high-potential crops (Table 3). In practical terms, consider two locations that both experienced a severe drought last year. In the location where farmers received substantial crop insurance indemnities for that drought, we observe that this year those farmers mostly replanted their usual crops (e.g., continued planting wheat); whereas in the location with little or no insurance payouts, farmers were more likely to take a more risk-averse approach by sowing a more diverse mix (perhaps adding more rye or peas alongside wheat). This comparison supports the idea that insurance programs are partially offsetting the need for on-farm diversification.

Table 3. Insurance and diversification

	(1)	(2)
	The Shannon diversification index	Share of high-potential crops
Lag direct payment rate	-3.5370***	0.4356***
	(0.4526)	(0.1473)
R-Squared	0.0428	0.0064
Observations	1,367	1,367

Notes: This table reports the effect of total insurance payout rate on diversification measures. All regressions include year fixed effects and province fixed effects. Standard errors are in parenthesis. Significance levels: ***p < 0.01, **p < 0.05, *p < 0.1.

The financial cushion from insurance payouts seems to give farmers confidence to continue with their preferred, specialised cropping pattern despite recent losses. From a policy perspective, this outcome is exactly the intended benefit of insurance – it removes some of the risk-driven distortions in production decisions. Farmers with effective insurance can make planting decisions based more on market signals and comparative advantage, rather than purely on fear of risk. Our results echo findings from other studies: for example, Yu and Sumner (2018) has noted that counties in the U.S. with higher crop insurance uptake see less crop diversity and more monoculture of insured crops, and Elabed and Carter (2015) found Malian cotton farmers who were offered insurance devoted more area to cotton (their primary crop).

In summary, without insurance, farmers experiencing shocks make more significant adjustments in their cropping patterns (i.e., increasing diversification), thereby potentially sacrificing some efficiency or productivity. With insurance, these effects are muted. This outcome has a dual implication. On the one hand, insurance clearly offers benefits by allowing farmers to continue specializing in profitable cropping patterns. On the other hand, by dampening diversification responses, insurance may inadvertently encourage a continuation of specialization that keeps vulnerability high. This phenomenon reflects the theoretical concern regarding moral hazard: if an insurance payout is assured, a producer might maintain a risky but high-expected-return crop, which could be problematic as severe climate events grow more frequent.

Policy Implications

The evidence from this research leads to a clear conclusion: climate shocks are already impacting farm management and productivity in Canada, but our existing risk management programs significantly help to counteract those impacts. As weather risks continue to grow, policymakers will need to strengthen and refine these programs, while also encouraging farmers to adopt more resilient practices. Below, we outline five key policy recommendations that emerge from our study's findings:

Strengthen and streamline BRM programs

- Ensuring the financial security of farmers in the face of climate risk is paramount. Our results show that farms with robust insurance coverage sustain higher productivity after shocks, highlighting the value of programs like AgriInsurance and AgriStability. Governments should commit to maintaining or increasing support for these programs so that coverage levels remain adequate as risks rise. Four practical refinements would make the BRM suite in general and AgriInsurance in particular more effective:

- *Guarantee prompt payouts*. Deliver AgriInsurance indemnities quickly after a claim is verified so producers can meet cash-flow needs for the next season without resorting to costly short-term borrowing.

- *Scale coverage to match losses*. Adjust loss-coverage caps upward and offer targeted top-ups in drought-prone zones so that indemnities more closely reflect revenue gaps observed in extreme years.

- *Trim red tape*. Replace lengthy claim paperwork with a concise, auto-filled form and establish a fast-track process for smaller AgriInsurance claims, making it easier for producers to participate.

- *Improve transparency*. Publish an annual BRM performance dashboard, reporting payout times, approval rates, and regional uptake, to give producers and provinces a clear view of how well the system functions.

- Streamlining the BRM suite in these ways will reduce uncertainty, encourage greater uptake, and ensure the programmes operate as the effective safety nets they were designed to be, where every public dollar spent on delivery prevents many more in farm-level losses.

Promote climate-resilient crop varieties

- Insurance addresses the financial aftermath of a crop failure, but it doesn't prevent the crop from failing in the first place. To truly secure productivity, Canada should invest in helping farmers adapt crops to new climate realities. This means accelerating the development and adoption of crop varieties that can withstand extremes – for example, drought-tolerant wheat, heat-resilient canola, or flood-tolerant forages. There have been promising developments from agricultural research (both public and private sector) in breeding for stress resistance, but uptake can be slow. Governments can incentivize faster adoption through cost-sharing programs, seed technology grants, or inclusion of these traits in crop insurance premium calculations (e.g., lower premiums for using approved resilient varieties). By planting more robust crops, farmers won't need to diversify as much solely out of fear of losing their main crop – the main crop itself will be better equipped to

handle adverse weather. This proactive approach can complement the reactive nature of insurance. In the long run, more resilient crop genetics will underpin both improved yield stability and reduced insurance payouts.

Tie insurance to on-farm risk reduction practices

- To address the potential moral hazard issue and to encourage a culture of resilience, policymakers should consider linking BRM program incentives to climate-smart farming practices. For instance, farmers who adopt cover cropping, conservation tillage, improved irrigation, or rotational grazing could receive discounts on insurance premiums or additional coverage benefits. These practices can reduce risk (by improving soil moisture retention, reducing erosion, etc.), so rewarding them makes sense – it keeps the insurance pool healthier by lowering the likelihood of massive claims. Empirical evidence from the United States shows that integrating farm safety-net programs with on-farm conservation practice boosts adoption of such practices (see Ifft and Jodlowski, 2024). Some jurisdictions outside Canada have tried "good farming practice" discounts in insurance, and the new Sustainable Canadian Agricultural Partnership (SCAP, 2023–2028) encourages integrating risk management schemes, such as Agri-invest, with environmental goals. Concretely, this might mean, for example, a 10% crop insurance premium rebate for farms that plant cover crops on a certain percentage of land, or a bonus payout if a proven drought-tolerant practice was in place but a drought still caused loss. These kinds of measures ensure that insurance and adaptation go hand in hand. Rather than insurance replacing prudent risk management on the farm, it would actively promote it. The result would be farms that are both well-insured and structurally more resilient, a win-win for producers and program funders.

Develop region-specific adaptation policies

- One-size-fits-all policy solutions may fall short in a country as vast and varied as Canada. Climate impacts and optimal responses in the Maritimes will differ from those in the Prairie heartland. We recommend tailoring BRM and support programs to regional realities. For example, in regions where drought is the top threat – insurance programs there might prioritize coverage for drought-related yield losses and support water-saving innovations. In contrast, in regions where excess moisture and early frost are bigger issues – programs might emphasize winter cover, tile drainage support, or frost protection measures. Even within insurance, the product design could vary: perhaps multi-peril insurance in one region versus index-based (weather parametric) insurance in another, depending on what works best. Additionally, region-specific advisory services should be bolstered. Extension agents or climate adaptation specialists can work with local farmers on strategies tailored to local conditions (for instance, different crop rotations, shelterbelt planting, irrigation scheduling). The federal-provincial framework allows for this flexibility, and provinces should use their room to maneuver to experiment and address their unique climate risks. Ultimately, a patchwork of regional solutions will likely be more effective than a monolithic policy, given the diverse challenges across Canadian agriculture.

Enhance data and monitoring for agile response

- Lastly, a more administrative but crucial recommendation is to invest in better data collection and early warning systems. One limitation we encountered was the lack of up-to-date, granular data on exactly what farmers are planting and their insurance decisions year to year. Modern technology (satellite remote sensing, digital farm reporting) could allow near real-time monitoring of crop cover and conditions. Governments should expand these systems to detect emerging risk patterns – for example, if a region's satellite imagery shows farmers suddenly planting way more of a traditionally minor crop, it could signal a response to an unseen stress or market change that bears further investigation. Improved data sharing between federal and provincial agencies (and even insurance providers) would allow faster adjustments to programs. For instance, if drought indicators reach certain thresholds, insurance claim processes could be expedited or advanced payments triggered automatically. Early warning systems for extreme weather (drought, flood, frost) should be linked to actionable support, such as activating AgriRecovery initiatives sooner. Essentially, the sector needs to become more proactive. Rather than waiting for the annual insurance tallies, an integrated climate-risk-information platform could guide timely interventions (like releasing emergency forage support in anticipation

of a feed shortage due to drought, rather than after cattle are already sold off). Investing in data infrastructure and climate intelligence now will pay off by preventing small issues from snowballing into crises.

- Taken together, these policy measures aim to manage the climate risk-productivity trade-off that this study has highlighted. Canadian agriculture is at a crossroads where it must continue to improve productivity to remain competitive and feed a growing population, yet it faces unprecedented environmental volatility. Bridging that gap requires both safety nets and innovation. Insurance and income support form the safety nets that catch farmers when they fall, and our analysis shows they are vital for keeping farmers on their feet after shocks. But we also need innovation in practices and technology (resilient crops, water management, data analytics) to reduce how often and how hard farmers fall in the first place. In conclusion, climate change will test the resilience of Canada's agri-food sector in the years ahead. The findings of this research underscore that while our current risk management tools are beneficial and indeed help maintain productivity in the face of adversity, there is room to enhance and modernize these tools. By reinforcing BRM programs, promoting on-farm adaptation, tailoring strategies to local needs, and embracing better data-driven decision-making, Canada can better support its farmers. The goal is to empower producers not just to survive in an era of climate risk, but to innovate and thrive – producing abundant food sustainably, with smart backups in place for the inevitable tough times. Such a holistic approach will ensure that Canadian agriculture remains productive, competitive, and resilient come what may in the climate future.

References

Agriculture and Agri-Food Canada (2025). Sustainable Canadian Agricultural Partnership. Accessed: 2025-03-14.

Arbuckle Jr, J., Morton, L., and Hobbs, J. (2015). Understanding farmer perspectives on climate change adaptation and mitigation: The roles of trust in sources of climate information climate change beliefs, and perceived risk. Environment and Behavior, 47(2):205– 234.

Bradshaw, B. (2004). Plus change? Questioning crop diversification as a response to agricultural deregulation in Saskatchewan, Canada. The Canadian Geographer, 48(2):97–114.

Claassen, R., Carriazo, F., Cooper, J. C., Hellerstein, D., and Ueda, K. (2017). Grassland to cropland conversion in the northern plains: The role of crop insurance, commodity, and disaster programs. American Journal of Agricultural Economics, 99(3):611–631.

Elabed, G. and Carter, M. (2015). Ex-ante impacts of agricultural insurance: Evidence from.

Feliciano, D. (2019). A review on the contribution of crop diversification to sustainable development goal 1 “no poverty” in different world regions. Sustainable development, 27(4):795–808.

Ifft, J., & Jodlowski, M. (2024). Farm heterogeneity and leveraging federal crop insurance for conservation practice adoption. Applied Economic Perspectives and Policy, 46(2), 572-594.

Just, R. E., Calvin, L., and Quiggin, J. (2003). The Economics of Crop Insurance and Disaster Aid. Springer Science & Business Media.

Kassie, M., Jaleta, M., Shiferaw, B., Mmbando, F., and Mekuria, M. (2014). Adoption of inter related sustainable agricultural practices in smallholder systems: Evidence from rural Tanzania. Technological Forecasting and Social Change, 87:18–29.

Kimura, S., Antón, J., and Le Thi, C. (2020). Farm income stabilization: The role of public policies in risk management. Technical Report 139, OECD Publishing.

Markowitz, H. (1952). Portfolio selection. The Journal of Finance, 7(1):77–91.

The Western Producer (2023). Crop insurance costs explode. Retrieved from https://www.producer.com/news/crop-insurance-costs-explode/

Ricardo, D. (1817). On the Principles of Political Economy and Taxation. John Murray, London.

Smit, B. and Skinner, M. W. (2002). Adaptation options in agriculture to climate change: a typology. Mitigation and Adaptation Strategies for Global Change, 7(1):85–114.

Yu, J. and Sumner, D. A. (2018). Effects of subsidized crop insurance on crop choices. Agricultural Economics, 49(4):533–545.

Zamasiya, B., Nyikahadzoi, K., and Mukamuri, B. (2017). Factors influencing smallholder farmers’ behavioral intention towards adaptation to climate change in transitional climatic zones: A case study of Hwedza district in Zimbabwe. Journal of Environmental Management, 198:233–239.