Assessing the feasibility of insurance products when combined with optimal crop management practices for wheat crop: A case study for Goondiwindi

Problem

Drought is a significant risk for farmers, which is further compounded by climate change. To mitigate drought-related risks, farmers adopt various technologies and management practices. One such practice is adjusting the sowing time to ensure better growing conditions and reduce the effects of drought. However, changing the sowing dates can also mean altering the cropping windows, which might expose the farmers to risks later in the season, such as insufficient rainfall during crucial crop stages. Such risks may make some farmers hesitant to shift their sowing dates and instead opt for a 'safer' sowing date that is not exposed to these risks, even if it results in lower overall yields on average.

Solution

Index-based agriculture insurance programs allow farmers to take "acceptable risk" by changing their sowing dates for higher crop yields. Often, farmers hesitate to undertake such a change due to other risks later in the season. To improve income stability in response to drought and climate variability and change, our strategy includes integrating index-based insurance with changes to sowing dates for dryland wheat producers.

Approach

We combined simulations of wheat lint yield with rainfall index-based insurance designs. To simulate wheat lint yields, we utilized the Agricultural Production Systems Simulator (APSIM)- Wheat model and considered different management strategies for various sowing dates. The index-based insurance payout is designed to trigger when the average rainfall during the growing season falls below a predefined level, such as the 5th, 10th, or 20th percentile.

Study location

Figure 1 depicts the Goondiwindi study site, located within Australian agro-environmental zones, selected for wheat yield simulations and insurance analysis.

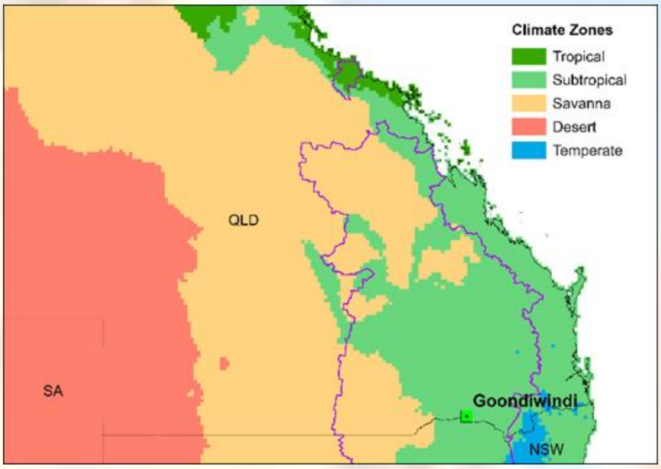

Figure 1. The study site selected for wheat simulations.

Key results

Figure 2 compares the income of wheat farmers who bought rainfall index-based insurance and those who did not. The comparison is based on different sowing dates and extreme drought conditions at the 5th percentile level of insurance coverage. Each element in the matrix shows the percentage change in income between insured farmers on the vertical axis and uninsured farmers on the horizontal axis for each sowing date. For example, if farmers sow wheat on 1 June and purchase rainfall index-based insurance, they could potentially earn around 0.4% more income compared to those who sow at the same time without insurance. The result indicates that in Goondiwindi, income can increase up to +25.0% in the case of a new planting date on 1 May with insurance vs. the current planting date on 22 June with no insurance.

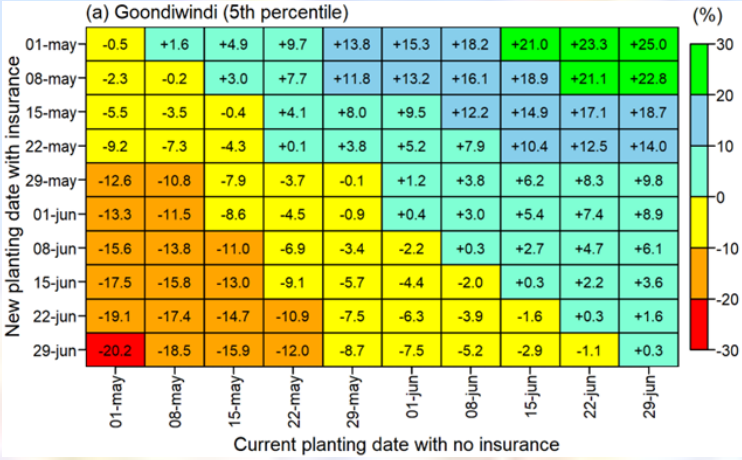

Figure 2. Comparison of income percentage change between wheat farmers with and without rainfall index-based insurance given different sowing dates at the 5th percentile level (extreme drought) of insurance coverage.

The information presented in Figure 3 compares farmers' income with and without insurance during drought years only. It is important to note that at Goondiwindi, wheat farmers who purchase insurance have significantly higher income than those who do not, regardless of the sowing dates. Combining the optimal sowing dates with rainfall index-based insurance can improve income by up to 48.4%, especially in the case of new planting dates on 1 May with insurance compared to other current planting dates without insurance.

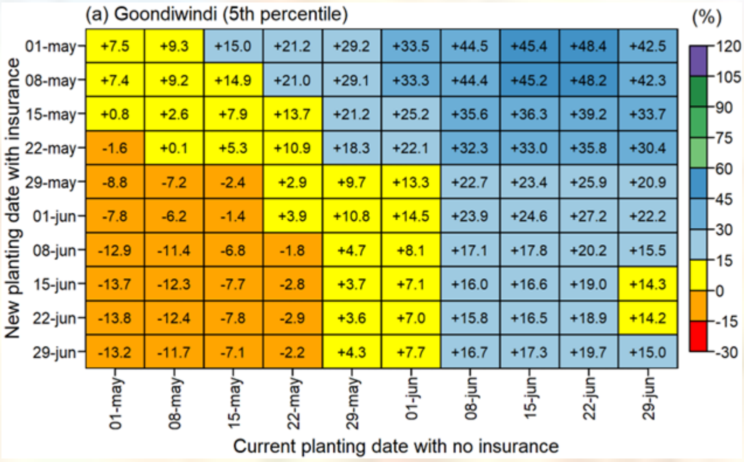

Figure 3. Comparison of income percentage change under drought years between wheat farmers with and without rainfall index-based insurance given different sowing dates at the 5th percentile level (extreme drought) of insurance coverage, which is considered as under extreme drought condition.

Conclusion

The proposed approach will facilitate the financial transformation of farming during extreme climate conditions by providing integrated crop management and insurance options that i) provide information about the crop management actions that will increase farmer profitability and ii) give farmers the confidence to invest in the profitable and resilience increasing management actions without suffering financial losses if severe drought conditions occur.

References

Nguyen-Huy et al. (2024). Assessing the feasibility of insurance products when combined with optimal crop management practices for wheat crop *(under preparation)*.

Acknowledgement

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