

## APPENDIX 6 Utility analysis

The focus in the main body of the paper centered primarily around the two measures of resilience: shock absorption and poverty reduction. Our results showed that—predicated on the structure of the model and scenarios—cover cropping reduces poverty by increasing income over time, while microinsurance effectively buffers income in the wake of a drought. However, other economic indicators may be relevant for households that are not as vulnerable to poverty (i.e., land-rich in our analysis). In particular, risk-averse households may be interested in reducing income variability in addition to increasing mean income. Hence, microinsurance may provide benefit to these types of household that our resilience analysis does not identify.

To formalize this benefit, we calculated an expected risk-averse utility on income over time under each scenario. We used an exponential utility function of the form  $1 - \exp(-X/R)$ , where  $X$  represents income and  $R$  represents the household's risk tolerance. Figure A6.1 shows that the utility of more risk-averse households (i.e., with lower risk tolerance) is more strongly benefited by insurance than cover cropping. Due to the delay in cover cropping's benefits on income, cover cropping leads to a short-term reduction in utility, which after 20-50 years increases to eventually exceed that of microinsurance. At lower levels of risk aversion (i.e., higher risk tolerance), the shape of the utility effects more closely mirrors that of expected income (Figure A4.1). Hence, by reducing income variability (specifically, the downside income risk), microinsurance may be a more promising strategy for risk-averse households that are not in poverty or whose crop yields are not highly nutrient limited.

When both strategies are implemented together, the long-run utility exceeds that of both strategies in isolation, demonstrating a complementary effect on utility. However, due to the short-term financial tradeoffs associated with cover cropping, the shorter-term utility of both options together is lower than with microinsurance. Nevertheless, particularly for a risk-averse household, at no point does the combined utility decrease below the baseline condition. This demonstrates that, from a utility perspective, the welfare impacts of the short-term losses associated with cover cropping may be offset by the risk reduction offered by microinsurance.

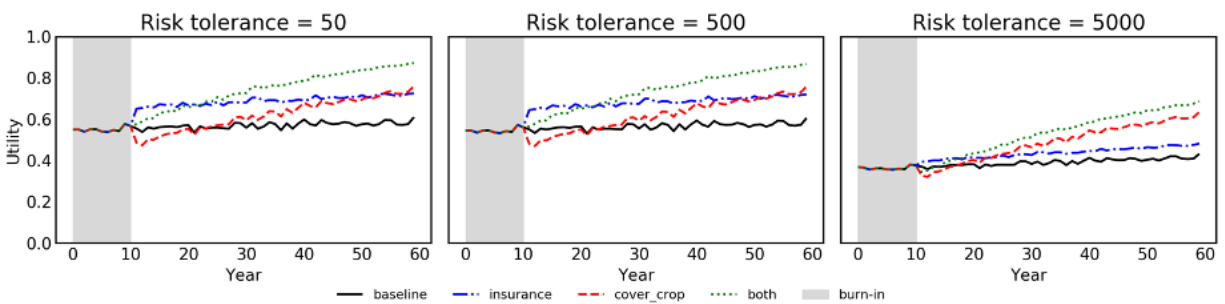


Figure A6.1: Expected utility over time for a land-rich household under three levels of risk tolerance. Higher risk tolerance corresponds to lower risk aversion.