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“Towards a holistic approach to Sustainable Risk management in agriculture” Sus-Risk



Policy Brief

**Deliverable D1.6 - The relationship between pesticides, weather and
risk in apple production (Task 1.c).**

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The relationship between pesticides, weather, and risk in apple production

1 Introduction

Apple production relies heavily on pesticides and therefore faces the challenge of aligning with the current environmental goals of the European Union (EU). In fact, as part of the Farm to Fork Strategy, the EU has set ambitious targets to transform the agri-food system into a fairer, healthier and more sustainable model. This push for significant reduction in pesticide use raises an important empirical question that is how such changes will affect agricultural productivity and farmer's income variability.

2 Evidence and analysis

The literature suggests that pesticide use in agriculture affects not only expected crop yields, but also yield variability, which in turn affects the variability of farm economic outcomes. Therefore, policies that restrict pesticide use are likely to affect both agricultural productivity and the uncertainty surrounding production processes. However, the effect of pesticides on crop risk remains ambiguous, as there is no consensus in the literature as to whether pesticide use increases, decreases, or has a neutral effect on risk (Serra et al., 2006, Serra et al., 2008, Koundouri et al., 2009; Antle, 2010; Gardebroek et al., 2010, Hurd, 1994).

The EU's push to reduce pesticide use, combined with increasingly adverse weather conditions that farmers face due to climate change (Dalhaus et al., 2020), could significantly reduce the welfare of risk-averse farmers. To assess the impact of this policy mandate and adverse weather risks on farmers, we used a flexible, moment-based approach. Specifically, we analyzed the impact of pesticide application and adverse weather events (such as heat waves and late frosts) on the probability distribution of yield and revenue per hectare in apple production in northern Italy.

The results indicate that pesticide use significantly reduces variation below the mean, classifying such an input as a downside risk-reducing input for both yield and revenue in apple production. Therefore, policies aimed at reducing pesticide use are likely to increase the risk exposure of apple growers. We found instead that extreme weather events - especially late frosts - reduce yields but lead to an increase in farm income. This increase is likely due to the inelastic demand for apples, where the reduction in quantity (i.e., lower yield due to frost) is offset by a larger increase in price, ultimately increasing average revenues.

3 Policy implications and recommendation

Given that late frosts may become more frequent due to climate change (Lamichhane, 2021), the combination of adverse weather conditions and a potential restriction on pesticide use could severely reduce the welfare of a risk-averse farmer, but also - potentially - affect consumer surplus through higher food prices. Therefore, a policy aiming at a strong reduction of pesticide use for environmental reasons should be accompanied by a strengthening of agricultural policies that promote the use of other risk management tools, such as insurance schemes or the income stabilization tool.

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