Changes in agricultural practices, including the adoption of cover crops, have complex impacts on overall cropping system managements. Decision analysis (DA) is a tool for clarifying decision trade-offs, quantifying risk, and identifying optimal decisions, but to our knowledge has not been applied to gain insight into management decisions related to cover crops. In this study we use publicly available data and simple assumptions to analyze decisions about planting an over-wintering rye cover crop in a maize/soybean rotation in Central Iowa. We found that planting a cover crop following maize (preceding soybean) poses less risk to the producer compared to planting following soybean. Furthermore, the risk of reduced maize yields when planting less than 10 days following rye termination substantially contributes to the overall risk cover crops pose to producers, but also has significant potential to be addressed through agronomic research. In addition to identifying research priorities, decision analysis provided clarity to a complex problem, was performed using publicly available data, and by incorporating risk it better estimated true costs to the producer compared to using input costs alone. We believe our study suggests decision analysis is a valuable and underutilized tool in agronomy and could aid in increasing adoption of cover crops in the Midwest.