

## **ECONOMICS OF METHYL BROMIDE USE IN CALIFORNIA STRAWBERRIES: CUE CRITERIA**

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Integrating scientific and economic results from a multidisciplinary research project, we evaluate whether or not California strawberries are eligible for a critical use exemption under the Montreal Protocol. We evaluate the economic feasibility of currently registered alternatives to MBr for California strawberry producers, given their degree of technical feasibility. We examine whether significant market disruption will occur as a result of the ban, and identify what factors outside our analysis may influence our conclusions. This exercise has implications beyond the strawberry industry. The EPA's interpretation of these criteria allows for significant discretion in awarding an exemption. Our procedure could be applied to other MBr uses.

At the field level, we find that *given material prices*, per acre fumigant and weed control costs are likely to increase, relative to methyl bromide, with the possible exception of shank-applied chloropicrin. Critically, changes in material prices will affect these costs, and may alter the relative cost-effectiveness of the evaluated alternatives. Our estimates exclude equipment and application costs, which would further increase the costs of some alternatives. Economic viability is also affected by the revenues growers will obtain. This suggests that the field-level economic viability of alternatives cannot be evaluated independently of market-level effects.

To address fully the CUE criteria, we examine the market-level effects of the different alternatives. As a measure of disruption, we calculate the percentage changes in price and acreage necessary for producers to break even under each alternative for a range of yield declines. Potential disruptions are largest for the most expensive alternatives. Acreage declines and price increases are significant for all alternatives in the anticipated 10-15% yield loss range. These findings are consistent with the large surplus losses estimated by other researchers. Producer adjustments may be even larger if imports increase, which would suggest greater disruption of the production side of the market. On the other hand, consumers would see smaller changes in the price and quantity of fresh strawberries, which would reduce consumer disruptions.

Ultimately, whether or not these effects constitute significant market disruption or economic non-viability is the decision of the parties to the Montreal Protocol. However, our analysis provides economic information based on the most current available scientific data. Uncertainty regarding the post-ban prices of alternative treatments increases the likelihood that the ban will result in significant market disruption. Further, the market-level analysis and the factors omitted from the field-level analysis both suggest that the field-level analysis may overstate the economic feasibility of alternative treatments. Overall, our analysis is consistent with some degree of market disruption as a result of the methyl bromide ban, and suggests that market-level factors, as well as field-level factors, must be considered when evaluating the economic feasibility of alternatives.

Our analysis has a number of limitations, including the standard limitations of field-level and market-level projections using baseline data. First, our experiment provides only a single year of data, so we cannot control for year-specific effects. Second, our data are from a single location. To the extent that the relative efficiency of alternatives differs across locations, our results may misstate the cost-effectiveness of alternatives and the market-level price and acreage adjustments necessary for the remaining acreage to break even. Third, we do not include organic or reduced-input production systems in our analysis. Despite these limitations, our analysis provides evidence regarding the eligibility of the California strawberry industry for a critical use exemption, and generates broader policy recommendations.

One emerging point that has broad applicability within agriculture is the importance of intellectual property rights. If a chemical is patented, then economic theory predicts that the patent holder will seek to maximize profits. Prices for that chemical will increase when the use of a competing alternative, such as methyl bromide is eliminated or restricted. Such behavior would suggest that our estimates based on current prices understate the likely cost increase. Perhaps a CUE could be made contingent on realized costs. Then, if material prices increase substantially in 2005, a CUE could be granted beginning in 2006.

In general, this suggests that policymakers should collect and report price information. While this point may be obvious to an economist, it is not commonly done for agricultural chemicals and other inputs at a sufficiently disaggregated level. More specifically, it suggests that the CUE process should consider the potential effects of changes in materials prices and market-level price and quantity responses on the economic feasibility of alternatives. The current CUE application form does not ask for information regarding the sensitivity of economic feasibility to the prices of alternative treatments, or information regarding the market-level price determination process.