ECONOMIC IMPLICATIONS OF BANNING METHYL BROMIDE: HOW HAVE THEY CHANGED WITH RECENT DEVELOPMENTS?

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Horticulturists in the United States, specifically in California and Florida, are the primary users of Methyl bromide, an agricultural fumigant. Their primary competition in these markets is the Mexican states of Baja California, Sinaloa, and Sonora. Several researchers have conducted studies to determine the economic impacts the banning of Methyl bromide will have on these agricultural producers. In 1993, Sunding et al. Estimate the losses to California agriculture to be $162 million. Deepak, Spreen and Van Sickle (1994) found that Florida growers' revenues for seven crops will decline 54 percent, from $1.144 billion to $524 million. They also project that the Mexican competitors' revenue will increase by 65 percent. Lynch (1996) finds that Florida and California tomato growers lose $86.6 million and tomato consumer welfare decreases $45.6 million with an increase in Mexican growers' welfare of $65.5 million. For strawberries, Florida and California growers' welfare decreases by $313.6 million. Consumer welfare decreases by $70.4 million. Mexican strawberry producers gain almost $90 million following the ban. These studies provide us with base-line impacts to use when evaluating the impact of the Methyl bromide ban.

In the last decade however, researchers have been investigating alternatives to Methyl bromide which may decrease the estimated impacts. In addition, California has relaxed its restriction on the use of 1,3-Dichloropropene (1,3-Dichloropropene). These new pest control technologies and the possibility of using 1,3-Dichloropropene in California require an update of the expected economic impacts. In addition, the North American Free Trade Agreement is now in place and affects the profitability of California's and Florida's major competitor, Mexico.

New alternatives considered in the analysis include 1,3-Dichloropropene and Chloropicrin for per-plant fumigation and steam sterilization for the greenhouse industry. 1,3-Dichloropropene costs $15.35/gallon to apply. 1,3-Dichloropropene fumigation for tree and vine crops will cost $510/acre. Annual crops such as tomatoes and carrots will pay closer to $155/acre. The fumigation cost for strawberries is expected to remain approximately the same. Steam sterilization requires a significant investment but is as or more efficient than Methyl bromide in the suppression of pests. A boiler sufficient to heat soil for typical greenhouse will cost growers about $30,000-40,000. If using natural gas, the greenhouse producer will pay $30-$40 per bed for steam sterilization. Methyl bromide fumigation costs approximately $6 per bed. In California, metam-sodium was considered the best alternative due to the inability to use 1,3-Dichloropropene. It controls fewer pests at a higher cost in all cases relative to 1,3-Dichloropropene or a 1,3-Dichloropropene/Chloropicrin mix. We do not use metam-sodium as an alternative in this analysis. Methyl Iodide in several studies has performed as well as or better than Methyl bromide for controlling pests in particular Fusarium Wilt. It has not been approved for use yet and it is not know whether it will be available in the year 2001, therefore we did not include it in the analysis as an available alternative.

How does the registration of 1,3-Dichloropropene affect the economic impacts in California? 1,3-Dichloropropene is now permitted for use in California under several restrictive conditions. 1,3-Dichloropropene can not be applied in a buffer zone of 300 feet around any school, hospital, business or

residence. The maximum amount of 1,3-Dichloropropene that can be applied without tarpaulin is 35 gallons per acre. The maximum amount under a tarpaulin is 24 gallons per acre. Within a 36 square mile area , no more than 5,000 gallons can be used if any application is made at depths less than 18 inches If all applications are made at depths of 18 inches or more, 9,000 gallons can be applied in the area. Growers must enforce a restricted entry interval of seven days, post warning signs or provide workers with protective gear. Based on expert opinion and the pesticide use data from 1989, we assume that California growers will voluntarily switch to 1,3-Dichloropropene for the following crops: tomatoes, carrots, lettuce, watermelon, peppers and sweet potatoes. Therefore the impact on these growers of a Methyl bromide ban will be zero. (California growers do not suffer from nut sedge or other pest problems facing Florida growers.)

With strawberries, recent research suggests that the yield losses for growers using 1,3-D and Chloropicrin will be in the range of 3 to 8 percent. In previous analyses, growers' highest profit alternate was metam sodium with a yield loss of 20 percent. 1,3-Dichloropropene is also expected to be the primary alternative for trees and vines crops. It results in a yield loss of 3 to 4 percent with a cost of $510/acre. Researchers and industry people also predict that the nursery industry will use 1,3-Dichloropropene for transplants, cut flowers, rose plants, fruit, vines and nut tree transplants with yield losses of 10 to 30 percent. In the greenhouse nurseries, another alternative is steam sterilization although this requires a significant investment it reduces yield losses to less than 5 percent. California strawberry growers' welfare decreased by $17.3 million. United States consumer welfare decreases by $3.6 million as the price of strawberries increases. California orchard crop owners will find their welfare decreases by $28 million. In the nursery industry, California owners welfare will fall by $33 million. Impacts by growing region are also calculated and demonstrate how much variation there is by location as well as commodity.

1,3-Dichloropropene was always available for use in Florida, yet the economic losses calculated for growers were substantial. New research suggests that 1,3-Dichloropropene combined with Chloropicrin is very effective at nematode and fungi control. This combination is less effective than Methyl bromide in controlling nutsedge. If the herbicide, pebulate, is added to this mix, growers are able to find comparable efficacy to Methyl bromide fumigation. Pebulate though has not been registered for use with transplants. Even with the fast-track of Methyl bromide alternatives, it is not clear that Pebulate will be available for use in the tomato industry by the year 2001. If 1,3-Dichloropropene, Chloropicrin and Pebulate are all available for use at this time, evidence suggests that the economic losses to Florida growers will be much smaller than previously calculated.

Some uncertainties still remain. We will not know the true yield losses from the ban on Methyl bromide until agricultural producers have used other alternatives for a number of years. If Methyl Iodine and Pebulate are available for use, it will decrease the dependence of California and Florida growers on one single chemical combination. 1,3-Dichloropropene has come under its own environmental and public health scrutiny and its long-term future or public acceptability is unknown. The availability of pest-free transplants which were used in many of these research studies is also threatened by the Methyl bromide ban. How this will impact pest population in the field is still not known. The new restrictions on 1,3-Dichloropropene may limit some growers from being able to use this chemical. Whether growers will transfer to a different area, use another alternative such as metam-sodium, or go out of business is also unknown. If the area use restriction becomes binding, which growers will have the right to use the chemical?