



The Value of Herbicides in Growing Fruit, Vegetable and Specialty Crops

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Figure 1: Impact of Weeds on Carrots



Source: H. Agamalian, University of California

Figure 2: Effect of Herbicides on Weed Control



Source: R. Bellinder, Cornell University

Weeds compete with crops for light, space, nutrients, and water resulting in significantly lower crop yields. Figure 1 shows the effects of uncontrolled weeds on carrot yield. Uncontrolled weeds clog harvesters and, if harvested with crops such as mint, spinach, green beans, and peas, lower the quality of the crop. Every crop acre in the US is infested with hundreds of millions of buried weed seeds, many of which remain dormant in the soil and capable of germinating for decades. Weeds are a ubiquitous pest that every farmer must manage each year.

Herbicides are chemicals which kill plants. Although several hundred chemical herbicides are used in US crop production, weeds are controlled in most fruit, vegetable and specialty crops with only 3-4 key herbicides that kill the primary weed species without harming the crop. Figure 2 shows the effectiveness of an herbicide treatment in controlling weeds in onions in comparison to a weedy check.

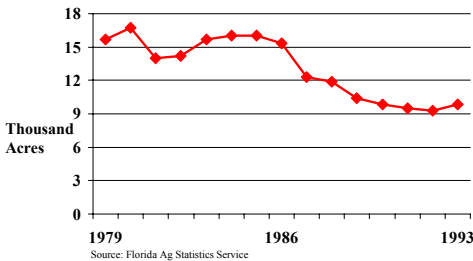
Figure 3: Handweeder in California, circa 1960



Source: H. Agamalian, University of California

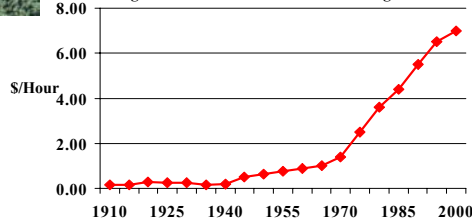
For some crops, the introduction of highly effective herbicides led to dramatic increases in yield by controlling weeds that had not been previously controlled because of narrow row planting which prevented handweeding. For example, blueberry production in Maine increased by 50 million pounds per year following the introduction of effective herbicides (Figure 5). In orchard crops, herbicides replaced cultivation of weeds with tractor implements—a practice that caused numerous problems including soil compaction, erosion and damage to trees. Herbicides substituted for 16 cultivations per acre per year in California almonds (2). Apple orchard yields are estimated to be reduced by 10% when cultivation is used due to mechanical damage to trees and roots (3).

Figure 6: Florida Lettuce Acreage



Source: Florida Ag Statistics Service

Figure 4: U.S. Hired Farm Worker Wage Rate



Source: USDA, ERS

Several new weed control problems have emerged in US crop fields in recent years due to the cancellation of herbicides, development of resistant weed populations, and climate changes. Usually, growers petition EPA for emergency registrations of effective herbicides and EPA typically grants the registration. In certain cases, emergency registrations are not granted due to regulatory issues, and growers suffer the consequences. For example, in the early 1990s due to a cancellation, Florida lettuce growers had no effective herbicide to control weeds within the lettuce plant rows. It took several years to develop the data required by EPA for a registration. In the interim, many growers abandoned lettuce production in Florida (Figure 6). The surviving growers paid up to \$700/A for handweeding crews before the registration of a herbicide which provided effective control at \$20/A.

Crop	State	% Yield Loss
Apples	Michigan	35
Asparagus	California	55
Carrots	Washington	60
Cranberries	Massachusetts	50
Mint	Oregon	45
Onions	Wisconsin	20
Peaches	New Jersey	50
Potatoes	Idaho	35
Strawberries	Florida	55
Cucumbers	Texas	30

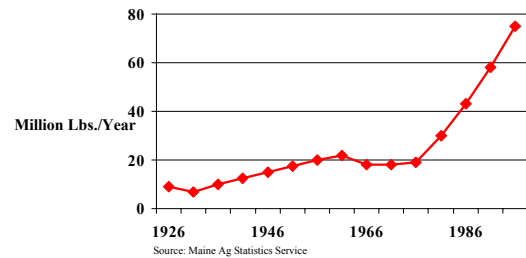
Source: (4) – (8)

Table 1: Herbicide Use

Crop	State	% Acres Treated
Almonds	California	86
Celery	Michigan	99
Asparagus	Washington	94
Carrots	Texas	100
Citrus	Florida	98
Green Beans	Oregon	99
Green Peas	Wisconsin	93
Spinach	New Jersey	90
Tomatoes	Massachusetts	91
Potatoes	Idaho	92

Source: USDA, National Ag Statistics Service

Figure 5: Maine Wild Blueberry Production



Source: Maine Ag Statistics Service

Surveys of organic growers regularly reveal that the biggest problem in organic crop production is weed control without herbicides (9). Detailed production budgets for organic growers indicate that they rely on a significant amount of handweeding (Table 3), which they can afford due to premium prices for organic foods. In some instances, organic growers rely on unpaid volunteers and family members for weed removal. Studies show that yields of organically grown produce are often lower due to poor weed control. For example, a five-year study of organic grapes in New York indicated that yields were 5-35% lower even with 13 hours of handweeding and 8 cultivations (15). An 8-year comparison of organic and conventional processing tomatoes in California indicated that tomato yields were 17% lower in the organic fields due to poorer weed control (17).

Crop	Hours / Acre
Apples	20
Cucumbers	30
Grapes	8-13
Green Beans	17
Lettuce	18
Onions	73
Tomatoes	15
Green Peas	12
Broccoli	22
Almonds	7

Source: (10)-(16)

In the 1990s, several reports from the USDA, AFBF, and the Weed Science Society of America estimated what the consequences would be if US growers had to go without the use of herbicides. For most states, these studies estimated that crop yields would decline significantly without the use of herbicides (Table 2). These studies took a pessimistic view of the availability and expense of hand labor to substitute for herbicides and concluded that the amount of labor that was affordable would not be enough to prevent these yield losses. In fact, for certain crops the USDA reports present a stark description of the likely consequences of the nonuse of herbicides. For example, for cranberries USDA concluded that “Without herbicides, up to half of US cranberry growers would eventually go out of business, since it would no longer be profitable to farm when their beds become overwhelmed with weeds in 5 to 10 years” (6).

Chemical herbicides are widely-used by US fruit, vegetable, and specialty crop growers because they are the most cost-effective method currently-available for controlling weeds to produce a marketable crop.

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