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Regulations on Methyl Bromide Fumigation Thrown Out by the Court

by

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In 2001, California implemented use regulations for methyl bromide, an important agricultural fumigant. The economic costs of these regulations were significant and unevenly distributed across growers. A recent court ruling makes it unclear whether these regulations will apply in 2002.

In January, 2001, the California Department of Pesticide Regulation (DPR) implemented state-level guidelines regarding methyl bromide fumigation. The purpose of these regulations was to reduce human health effects on applicators and others in the area of the fumigated field due to acute short-term exposure to methyl bromide. The regulations were enacted in response to a 1999 court order by a San Francisco Superior Court judge, who ordered DPR to adopt more specific use regulations for methyl bromide.

Last month, Superior Court Judge A. James Robertson set aside the DPR guidelines. He ruled that the DPR improperly set up the regulations and should have consulted with the California Department of Food and Agriculture (CDFA) before implementing the regulations. Under the Court ruling, the DPR and CDFA must consider the economic impacts of the regulations before re-writing them.

We discuss some of the economic effects of the January, 2001 regulations as implemented by DPR. Although they have been set aside, the January 2001 guidelines were in effect for one season and they will likely serve as a starting point for the development of new regulations. Overall, such regulations are potentially quite costly for growers, and the effects are distributed unevenly across growers.

Methyl Bromide Use Regulations

As implemented in 2001, the methyl bromide use regulations had significant economic costs. In addition to a loss in acres that could be fumigated, growers' fumigation practices were limited. The regulations increased the time necessary for fumigation for many fields, and increased the time spent by most growers in complying with the regulations. Further, many of the economic costs of the use regulations were unequally distributed across growers. Growers with small fields faced a proportionately larger acreage loss than growers with large fields, holding other factors constant. Growers in areas of high population densities faced higher costs associated with permission, notification and buffer zone requirements.

Due to regulatory specifications of emissions ratios, buffer zone requirements were much more onerous for "bed" fumigation, where only the raised beds are fumigated. Some growers had little choice but to switch to "flat" fumigation, where the

METHYL BROMIDE-*Continued on page 2*

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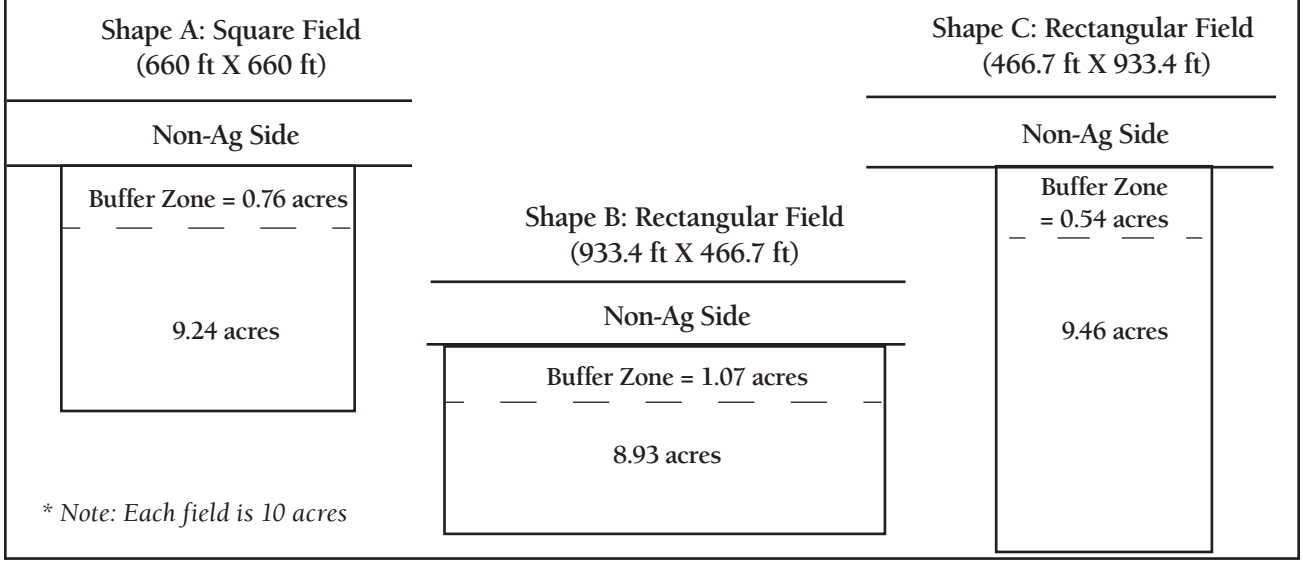
Figure 1. 50-foot Buffer Zone Impact Depends on Field Shape



entire field is fumigated. Flat fumigation is much more expensive.

Under the U.S. Clean Air Act and international agreements, methyl bromide will be banned for fumigation purposes in the United States in 2005. Methyl bromide was applied to over 75,000 acres of California farmland in 2000, according to the DPR's preliminary product use reporting data; crops that rely on methyl bromide for pre-planting fumigation include strawberries, melons, sweet potatoes, peppers, tomatoes, lettuce, grapes, nursery plants, and orchard crops such as almonds and walnuts.

The DPR use restrictions were quite complex. Two types of buffer zones were specified: an inner buffer zone and an outer buffer zone. Both were designed to protect members of the public from acute short-term exposure to methyl bromide. Only individuals involved in the fumigation process were allowed into the inner buffer zone. These individuals were subject to additional requirements regarding the maximum exposure times for various fumigation tasks. The inner buffer zone had to be on agricultural land, or a public roadway.

People were allowed into the outer buffer zone for transit purposes, or to "conduct activities approved by the county agricultural commissioner." Here, individual exposure was limited to no more than twelve hours out of any twenty-four. The outer buffer zone was not limited to agricultural land, but could extend into other property, with the exception of occupied housing, schools, and other sensitive sites. For both types of buffer zones, the operator had to obtain permission from the landowner to extend the buffer zone onto his property. Total acreage for a single fumigation block was limited to 40 acres in any 24-hour period. Since the minimum buffer zone requirement increased with the total acreage fumigated, in many cases the effective fumigation block was much smaller.

Overall, these requirements increased the number of days required to complete fumigation of a field. There were substantial notification requirements included in the regulations, and restrictions on work hours for applicators. These regulations lengthened and otherwise complicated the fumigation process.

Acreage Loss Due to Inner Buffer Regulations

A major impact of the DPR regulations on growers was that some acreage could no longer be fumigated with methyl bromide. Inner buffer zones could not extend onto adjacent non-agricultural properties, and could extend onto adjacent agricultural properties only with the permission of the property owner. If a neighboring property was non-agricultural, or if permission was not granted, then part of the field could not be fumigated. This impact varied by field. The differential effects of the regulations for a fixed number of acres but for three different shapes are illustrated in Figure 1, for a 10-acre field. The acreage calculations are for an application of pure methyl bromide of 200 pounds per acre, using flat fumigation. 200 pounds of pure methyl bromide is equivalent to roughly 350 pounds of

a 57:43 methyl bromide/ chloropicrin application mix. Each field loses the 50 feet bordering the non-agricultural side. The effects of the 50-foot buffer are greatest for field shape B, with the longer side bordering a non-agricultural use. As a result of this loss, over 10% of field shape B's acreage could not be fumigated with methyl bromide, roughly twice the loss of field shape C. The square field shape A represents the intermediate case.

An additional set of calculations shows the combined effects of acreage and field shape. Table 1 reports the share of total acreage that could not be fumigated with methyl bromide, under the January 2001 use regulations. Table 1 was constructed using the following assumptions: Application rate is 200 pounds/acre. Flat fumigation emission ratio is 0.4. Bed fumigation emission ratio is 0.8. Maximum fumigated acres: 15 acres/ day. The table shows the percentage of minimum loss for fields with different acreages, different shapes, and using different fumigation methods. The table was constructed under the assumption that the optimal fumigation plan with the smallest acreage loss was used. Clearly, the impact of the use restrictions depends upon field size. A larger percentage of the acreage of smaller fields could not be fumigated. The longer the side of the field bordering the non-agricultural use, the larger the percentage of total acreage that cannot be fumigated. In Table 1, the rectangular field with the long side bordering the non-agricultural use (Shape B) loses the largest share of acreage.

Bed fumigation results in a larger share of non-fumigated acreage, due to its higher emission ratio. Finally, as the number of sides with a non-agricultural use increases, acreage loss increases as a share of total acreage.

Outer Buffers

In contrast to inner buffer zones, the outer buffer zone could extend into all other property except occupied housing, schools, hospitals, convalescent homes and other sensitive sites if permission was obtained from the landowner, and if worker notification and other regulatory requirements were met. The restriction on time spent in the outer buffer zone was much less stringent, only limiting an individual to twelve hours in a twenty-four hour period. The minimum inner buffer zone was 50 feet, and the minimum outer buffer zone was 60 feet.

The effect of the outer buffer zone requirement on the acreage losses reported above depended upon the uses of nearby land parcels, and the distance each parcel was from the intended fumigation site. Occupied houses, hospitals, schools and similar sensitive sites must be outside the outer buffer.

In addition, farmers were required to notify all property owners within 300 feet of the edge of the outer buffer zone. If these individuals requested at the time of the initial notification, the farmer was required to notify them again within 48 hours of the actual fumigation. We collected data that allowed us to estimate the magnitude and distribution of the direct

Table 1. Non-Methyl Bromide Fumigated Acreage as a Percentage of Total

	Shape A (square)	Shape B rectangular (long side non-ag)	Shape C rectangular (short side non-ag)
One Non-Agricultural Border			
Ten-acre Field	7.6	10.7	5.4
Ten-acre Field(bed)	15.2	21.4	10.7
Fifty-acre Field	3.4	4.8	2.4
One hundred-acre Field	2.4	3.4	1.7
Two Contiguous Non-Agricultural Borders			
Ten-acre Field	14.6	15.5	15.5
Ten-acre Field(bed)	28.0	29.8	29.8
Fifty-acre Field	6.7	7.1	7.1
One hundred-acre Field	4.7	5.0	5.0
Two Parallel Non-Agricultural Borders			
Ten-acre Field	15.2	21.4	10.7
Ten-acre Field(bed)	30.3	42.9	21.4
Fifty-acre Field	6.8	9.6	4.8
Three Non-Agricultural Borders			
Ten-acre Field	21.6	20.2	25.8
Ten-acre Field(bed)	40.8	38.3	48.9
Fifty-acre Field	9.9	9.3	11.8
One hundred-acre Field	7.1	6.7	8.4
Four Non-Agricultural Borders			
Ten-acre Field	28.0	29.8	29.8
Ten-acre Field(bed)	51.4	55.1	55.1
Fifty-acre Field	13.1	13.9	13.9
One hundred-acre Field	9.4	9.9	9.9

costs of this requirement. Preliminary analysis suggests that the costs would have been unevenly distributed across fields; producers with fields at the urban-agricultural edge would have paid a disproportionate share of the total cost.

Impacts of the Regulations

The acreage lost due to the DPR methyl bromide use regulations depended upon the size and shape of an individual field, as well as on the use of adjacent parcels. Smaller fields lost a larger percentage of total acreage, holding other factors constant. Fields with more non-agricultural borders lost a larger percentage of total acreage, again, holding other factors constant. It is important to emphasize that these losses presumed that owners of adjacent parcels would always give permission for buffers to extend onto their property, when this was allowed by the regulation; in practice, there is no guarantee that this would have been the case.

The regulations imposed a number of other costs on agricultural producers. Designing a fumigation plan that complied with regulatory requirements was much more time-consuming than was the case prior to these regulations. The total time required to fumigate increased for many fields, which affected production planning and profitability. In the case of strawberries, for example, lengthening fumigation time shortens the harvest period for the previous year's crop, since it must be removed earlier in order to complete fumigation prior to the planting season. Notification requirements are quite time consuming, and can negatively impact neighbors' perceptions of agricultural activities. This perception may ultimately limit producers' freedom to operate according to best agricultural practices in still unforeseen ways.

The impact of the DPR use regulations on producers was unequal. Growers in areas with higher population densities were much more likely to be heavily impacted by the buffer zone, permission, and notification requirements. Growers with smaller fields faced a proportionately greater loss of fumigated acreage than growers with large fields. Growers who had to discontinue bed fumigation saw their costs rise dramatically.

These potential effects have troubling implications regarding the impact of the use regulations across different population groups. To the extent that it is the small growers who farm small fields, small growers were disproportionately affected by the regulations. Further, the complexity of the regulations disproportionately increased the burden of regulatory compliance for less educated growers, or growers who are less than fluent in English. Language differences may also limit the ability of some growers and neighboring landowners and residents to communicate effectively. In turn, this may reduce the acreage that growers can fumigate, if they are unable to secure permission to extend buffer zones into neighboring properties. Conversely, some neighbors may not understand fully their rights regarding notification and buffer zone permissions.

One of the crops most affected by the 2001 methyl bromide regulations was strawberries. The methyl bromide use regulations increased the costs of producing strawberries in California. The effect on the retail price of fresh strawberries depends on the extent to which imports compensate for any reduction in domestic production. Producers in Mexico, Chile, and elsewhere are not subject to the same environmental regulations as are California producers. An increase in imports will make it difficult for California producers to recoup cost increases from complying with the regulations. Potentially, consumers could be unaffected; the only change would be the location where the strawberries are grown.

Was the recent Court decision to invalidate the DPR restrictions a clear victory for growers? We do not know for certain. It is too early to determine if the Court decision will help growers. The state could simply impose emergency rules for the 2002 fumigation season that duplicate the 2001 regulations.

Alternatively, the DPR may re-introduce identical regulations and follow procedures that are acceptable to the courts. Whatever the outcome, the judge has determined that the economic effects of the regulations must be given more attention that in the past.

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Outlook for Farm Financial Conditions

by Steven C. Blank

USDA forecasts lower total farm income for 2002 and, for the first time, negative average farm income per farm operator household. Ironically, non-farm income and demand for land are supporting farmers in regions where crop diversification is not readily possible. California is performing better.

Farm financial conditions depend upon the flow of farm income and farmers' wealth. Therefore, this paper looks briefly at some factors that influence farm income and wealth now and in the future.

Income Issues

Farm income depends upon prices and costs. The trends in these factors illustrate the pressures facing American production agriculture.

Prices for undifferentiated agricultural commodities are determined by global supply and demand factors, and prices are declining as global output expands. The USDA's Index of Prices Received for agricultural output decreased 7% in nominal terms from 1990 to 2000. Global agricultural output is increasing due to expanded production in nearly all parts of the world.

Total costs of production are determined by local supply and demand factors for inputs, and in America those costs are going up as competition for resources expands with alternate uses. The USDA's Index of Prices Paid by farmers for inputs increased 19% from 1990 to 2000. Production costs per unit of output are also influenced by productivity.

Productivity improvements (e.g., yield increases) in American agriculture lower costs per unit of output, but contribute to the global surplus, thus adding downward pressure on prices. Therefore, farm income is the net result of a "race" between falling prices and producers' ability to lower production costs per unit through adoption of new technologies and other means of improving efficiencies.

National Totals. Many analysts have focused on either nominal sales revenues or "net farm income" and concluded erroneously that agriculture's performance was strong. The top portion of Table 1 reports the USDA's total values for various income statement items for 1998-2002. Cash receipts have increased most years. In fact, until the 2002 forecasts were released, it looked like net farm income was on a steady upward trend in recent years. However, those trends are misleading. Much of the reported net farm income came from sources such as "direct government payments" which, when removed, leave a much less optimistic view of farm income. Adjusted production income calculated in Table 1 is substantially lower.

In real terms the trend in adjusted production income has been downward for half a century. 1973 was the only year over the last 50 to have a higher income than the year 1951.

The farm income totals have not done well when converted into investment performance measures either. The average return on equity in American agriculture has trended downward over the last 40 years, from 2.5% in 1960 to 1.5% in 2000.

Farm-level Averages. Converting the national total income data into averages per farm operator household reveals another downtrend. The middle portion of Table 1 shows that net cash farm income and earnings from farming (which is calculated by subtracting various costs from net cash farm income) are both declining. One alarming result is that, for the first time, earnings from farming are expected to be negative in 2002!

A second alarming result visible in Table 1 is the reliance of farm operator households on off-farm sources of income. Clearly, with forecast average earnings from farming of -$198 in 2002, the financial condition of the "average" farm would be grim if it were not for off-farm income. On average, agriculture is being subsidized by farmers' other activities. This has been true for decades, but the scale of the subsidy has grown in recent years. The ability of farm operators to subsidize agriculture depends, in part, on the availability of off-farm sources of income. If the general economy of a region weakens, causing off-farm income to decrease, the effects on agriculture could be magnified as operators are forced to leave the industry. That exodus would adversely affect farmland values as farms are sold. In turn, the resulting decline in the agricultural economy of the region could exacerbate the general economy's decline in the area.

Both of the alarming results noted above are due to the structure of American agriculture. On average,

Table 1. U.S. Farm Income and Balance Sheet Items, 1998-2002

	1998	1999	2000	2001F	2002F
Income Totals		*$ billion*			
Crop receipts	101.7	92.6	94.1	95.8	97.9
Livestock receipts	94.1	95.6	99.5	106.1	106.4
Total cash receipts	195.8	188.1	193.6	201.9	204.3
Net farm income	42.9	44.3	46.4	49.3	40.6
Direct government payments	12.4	21.5	22.9	21.1	10.7
Adjusted production income*	30.5	22.8	23.5	28.2	29.9
Farm Income Averages		*$ per farm operator household*			
Net cash farm income	14,357	13,194	11,175	10,888	8,006
Earnings from farming	7,106	6,359	2,598	2,447	-198
Off-farm earnings	52,628	57,988	9,349	59,943	59,343
Average farm household income**	59,734	64,347	61,947	62,390	59,145
U.S. Farm Balance Sheet		*$ billion*			
Farm assets	1,085.3	1,140.8	1,188.3	1,216.6	1,228.1
Real estate	840.4	886.4	929.5	957.3	968.8
Total farm debt	172.9	176.4	184.0	192.8	196.5
Real estate	89.6	94.2	97.5	103.1	104.6
Farm equity	912.4	964.4	1,004.3	1,023.8	1,031.6

F= forecast
Source: USDA on web at: http://www.ers.usda.gov/Briefing/FarmIncome/fore.htm. (January, 2002)

**This is calculated as net farm income minus direct government payments.*
*** This is the sum of earnings from farming and off-farm earnings.*

large-scale farms are profitable while deriving most of their income from agriculture, and small-scale farms lose money on their agricultural activities, but depend upon off-farm sources for their primary income. "Commercial farms" (the 8.2% of U.S. farms with annual sales of $250,000 or more) are expected to have average net cash income of $117,800 in 2002, compared to their 1996-2000 average of $141,800. Yet, about 50% of "large family farms" (those with sales of $250,000 to $499,999) report that either the operator or the spouse did some off-farm work. "Intermediate farms" (the 28.9% of U.S. farms with sales below $250,000 yet whose operators report farming as their major occupation) are expected to have average net cash income of $7,200 in 2002, compared to their 1996-2000 average of $12,300. "Rural residence farms" account for the remaining 62.9% of farms and are expected to have average net cash income of -$2,800 in 2002, compared to their 1996-2000 average of -$1,800.

Implications. The structure of American agriculture and the declining income trends combine to create some significant implications for future farm financial conditions. First, in the case of commercial farms, they often cannot afford to diversify their income sources to include substantial off-farm investments, thus they must diversify and shift their on-farm income sources: the crops produced. Most commercial producers need to reinvest profits back into their operations to expand or maintain their economies of scale in an effort to remain cost competitive. Therefore, commercial operators must look for crops that will provide income levels sufficient to meet their financial obligations. In other words, the portfolios of most commercial farmers include investments in crops and little else. Income pressures are pushing farmers to increasingly shift resources from the production of low-value field crops into the production of high-value specialty crops (e.g. fruits and vegetables). Specialty crops do generate higher average income levels, but are riskier in that there is much more volatility in the income streams over time. Therefore, necessary cropping changes are gradually making large farms more risky.

Ironically, small farms are less risky despite the fact that they lose money on average! The reason? They are diversified such that a large majority of their income

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Economic Costs of Recent Changes to the Wetland Permitting Process

by
David Sunding

Though wetland permitting strives to support environmental concerns of land use and conservation, recent changes in certain permitting processes may not be the most effective or efficient solution available.

The issue of a license to pollute is a common tool used by the federal government to regulate environmental quality. A prime example of this type of regulation is the wetland permitting system operated by the Army Corps of Engineers. These permits are needed before private developers or government agencies can undertake activities that would affect wetlands.

Over the past two years, the Corps has moved to revamp its wetland permitting process. In particular, it has increased the degree of oversight needed to obtain permits for many types of activities. Given the importance of wetland regulation to both the environment and to many sectors of the economy (e.g., agriculture, real estate development, road construction and others), it is important to assess the effectiveness and efficiency of these changes.

Wetland Permitting

The Clean Water Act authorizes the Corps of Engineers to issue two different types of permits: general and individual permits. General, or "nationwide," permits (NWP) are streamlined permits for activities that have only minimal individual and cumulative impacts on wetlands. Activities that involve more than minimal impacts to wetlands are authorized by individual permits in which the Corps evaluates an applicant's specific proposal. Individual permits are authorized through a standard process that requires public notice and a high degree of scrutiny of the proposed project.

Before the recent changes enacted by the Corps, more than 80 percent of roughly 50,000 wetland permits issued each year were general permits. In response to complaints by environmental groups, the Corps tightened the standards by which projects qualify for the streamlined permits. Most importantly, the Corps ruled that a project disturbing over a certain number of wetland acres (using a sliding-scale formula based on the total size of the project) would have to be permitted through the individual permit process.

A good example of these changes is given by NWP 26, the nationwide permit covering development in "headwaters and isolated waters" before 2000. This permit was eliminated by the Corps and replaced with a set of more stringent permits, each for a different type of activity (e.g., residential development, road maintenance, irrigation ditches, etc.). The Corps defines headwaters as "non-tidal streams, lakes, and impoundments that are a part of a surface system tributary to interstate or navigable waters of the United States with an average flow of less than five cubic feet per second." Isolated waters are defined as "non-tidal waters of the United States that are not part of a surface tributary system to interstate or navigable waters of the United States and are not adjacent to interstate or navigable waters." Thus, contrary to the typical minds-eye picture of wetlands, the areas covered by NWP 26 may be on hillsides or even have very little apparent water at all.

Prior to its elimination in 2000, NWP 26 was the most commonly used general permit. In the year before its elimination and replacement with other permits, the Corps issued roughly 7,500 permits per year under NWP 26. These activities impacted 3,423 acres of wetlands and other "waters of the United States," for which applicants provided 13,354 acres of mitigation. Owing to the nature of wetlands it regulated, NWP 26 was especially important in the western states.

Economic Impacts

Environmental permitting requirements impose significant costs on project developers and operators. These costs result from the need to conduct scientific investigations, negotiate with the issuing agency over the conditions of the permit and to redesign the proposed project based on the agency's decision. There are also costs resulting from delays in completing the project. The recent changes to the wetland permitting process will only increase these permitting costs, and some economic analysis is needed to assess the magnitude of the change.

Table 1. Time to Prepare and Obtain a Wetland Permit

	Days to Prepare Application (1)	Days from Submission of Application to Decision (2)	Days from Completed Application to Decision (3)	Total Calendar Days (1+2)
Survey				
Individual	383	405		788
Nationwide	184	129		313
Difference	199	276		475
Corps Statistics				
Individual			127	
Nationwide			16	
Difference			111	

Recently, David Zilberman and I conducted a detailed examination of more than 100 individual and nationwide permit applications to understand their relative costs and to gain a better understanding of the timing of the permit process than is available from government data. We collected information on the project, the parameters of the regulatory process (i.e., individual or nationwide permit, dates of regulatory milestones, final decision, amount and type of mitigation required) and the types of expenses incurred by the applicant during the permitting process.

We found that, for a project of a given size, an individual permit costs the applicant $43,687 plus $11,797 for each acre of wetlands impacted. For nationwide permits, costs were measured as $16,869 plus $9,285 for each acre of waters of the United States impacted. For an average-sized project, one that impacts close to 1.5 acres of wetlands, a nationwide permit costs $29,000 to obtain and an individual permit costs $60,000 – or a difference of $31,000.

With these figures in hand, it is possible to calculate the cost of replacing NWP 26 with a stricter set of permits – ones that more often require applicants to go through an individual review process. To begin, note that the Corps figures that 58% of the 7,500 projects previously authorized under NWP 26 each year will now require individual permits. Thus, the additional cost of preparing wetlands permits amounts to over $140 million annually – a large impact from a small and perhaps obscure change in environmental regulations. Note that this figure does not include other costs associated with stricter permitting, such as the cost of increased mitigation, the cost of required design features, or, significantly, the cost of delaying completion of the project. Our study concludes that these factors increase the cost of eliminating NWP 26 to over $300 million annually.

The magnitude of this impact should be evaluated in relation to the small number of wetland acres affected by the now-defunct NWP 26 permit – only around 3,000 acres per year. If the elimination of this streamlined permit costs the regulated community $300 million annually, then the cost of the reform is roughly $100,000 per wetland acre affected. In reality, the cost of conservation embodied in the permitting reform is much higher than this. Eliminating NWP and forcing projects to be approved via the more arduous individual permit process only protects wetlands to the extent that the new program catches "mistakes" allowed under the old program, namely projects that were permitted and should not have been. Most of the criteria by which the Corps is planning to approve or disapprove projects remain unchanged, with the exceptions detailed earlier. Suppose that the Corps approves 95 percent of all applications under the old rules and will approve only 90 percent under the new rules. Then the permitting changes impose a cost of over $100,000 on all acres affected by the program, but amount to a cost of over $2 million per acre conserved that would have been altered under the old permitting program. It is obviously worth asking if this is the most efficient way to protect the nation's wetlands.

Before considering efficiency, however, it is worth pointing out another aspect of permitting cost not usually included in economic impact analysis (and excluded from the $300 million figure above) – the delay caused by environmental permitting. We asked permit applicants about three dates: the date the applicant began compiling information needed to submit an application, the date at which the application was submitted to the Corps, and the date at which a final decision was received. These time periods were then broken down between individual and nationwide permits. The results are displayed in Table 1.

Nationwide permits in our sample took an average of 313 days to obtain – far longer than the few weeks

implied by the Corps' accounting. The main reason for the discrepancy is that the Corps only counts the time from the date that it deems an application to be complete until it reaches a decision. This accounting ignores the time needed to prepare the application, which comprises the majority of the total permitting time required for both nationwide and individual permits. The applicants in our sample also indicated that it took an average of 788 days from the time they began preparing the application to the time they received an individual permit, of which 405 days elapsed after the application was submitted to the Corps office. One implication of this finding is that it actually takes an applicant 475 extra days to obtain an individual as opposed to a nationwide permit. This delay will impose significant costs on project developers and operators, and also on consumers of project outputs. These costs are not quantified here, but it is certainly worth noting that they exist.

Efficiency Considerations

Given the magnitude and breadth of the costs imposed by the elimination of streamlined wetland permits, it is worth asking how they compare to other policies available to the government for protecting wetlands. Economists have noted a basic distinction between programs intended to conserve existing wetlands and those attempting to restore areas that were previously wetlands. With regard to costs, economists have found that restoration of wetlands is usually much less expensive than conservation. The reason lies in the fact that there is a large supply of former wetlands that are only marginally suited to economic uses. Wetlands that are profitable to develop or have a high level of agricultural productivity, by contrast, can be quite expensive to conserve.

The Wetlands Reserve Program (WRP) is a good example of a policy intended to facilitate restoration of wetlands. Congress created the WRP with the Food, Agriculture, Conservation and Trade Act of 1990, as amended by the 1996 Farm Bill. The Natural Resource Conservation Service (NRCS) administers the program in consultation with the Farm Service Agency, and funding for the WRP comes from the Commodity Credit Corporation. Landowners choosing to participate in the WRP may sell a conservation easement or enter into a cost-share restoration agreement with the USDA to restore and protect wetlands. The landowner voluntarily limits future use of the land, yet retains ownership. The landowner and NRCS jointly develop a plan for the restoration and maintenance of the land. The program offers landowners three options: permanent easements, 30-year easements and restoration cost-share agreements of a minimum 10-year duration. Nationwide, 774,076 acres are enrolled in the program.

The USDA's Economic Research Service (ERS) recently concluded that the cost to the government of the WRP is around $600 per acre of wetlands restored. When comparing this figure to the implicit cost of conserving an acre of wetlands by restricting the use of streamlined permits, it appears that other policies, such as WRP, are much more efficient. There are even federal programs that achieve conservation at a lower cost than the reformed permitting program. For example, the federal government is acquiring land through a variety of programs to add to the stock of the nation's wetlands. The ERS has estimated the mean cost of conservation under these programs is $2,215 per acre. Again, this figure is low compared to the cost of conservation achieved through more stringent permitting.

Permitting is a major cause of environmental regulation. Recent changes to the wetland permitting process have made it more difficult to obtain permission to utilize wetlands. These changes impose large, hidden costs, on developers, local government, tax payers and consumers. There may be other federal and state programs that protect wetlands at a fraction of the cost of the changes previously discussed. Future research is still needed to fully identify the most effective and efficient strategies for protecting the nation's wetlands.

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(>100%) comes from off-farm sources, which may be much less volatile than agricultural markets.

Wealth Issues

The bottom portion of Table 1 shows national total farm equity increasing in recent years. However, some inconsistencies in the income and equity trends may signal future trouble for farm financial conditions.

Most farm equity is in farmland. As shown in Table 1, real estate represents 78.9% of farm assets and 53.2% of total farm debt in 2002. Of interest is that 95% of the increase in farm equity reported over the 1998-2002 period comes from increased equity in farm real estate, meaning that farmland values have been increasing despite declining earnings from farming. If agricultural income has not been strong, as indicated by the falling real cash rents observed over the last two decades, then what has been pushing up farmland values in recent years? One answer was provided by the USDA:

"Although average agricultural land values nationally are determined primarily by the income earning potential of the land, nonagricultural factors appear to be playing an important role in many local areas. To some extent, the buoying effect of these nonagricultural factors on agricultural land values could be partially offsetting the effect of lower returns from agricultural production."

What the USDA report called "urban influence" affects only about 17% of U.S. farm acreage, but that acreage is scattered around the country. The USDA classifies only 515 counties in the U.S. as being both completely rural (contains no part of a city with at least 2,500 residents) and not adjacent to a metro area. In all remaining counties, the USDA says there is some degree of urban influence on land values.

Urban influence has a significant impact on farmland values. The USDA estimated that during 1994-96 the value of farmland that was not urban-influenced was $640 per acre, compared to $1,880 for urban-influenced farmland. Thus, 66% of urban-influenced farmland market value was due to anticipation of eventual nonagricultural uses.

In some areas, the amount of urban influence on farmland values can be extreme. For example, in California's Ventura County a 35-acre parcel of farmland was recently valued at about $300,000 per acre, due almost entirely to its development potential.

The conflicting trends of decreasing farm earnings and increasing farmland values match the pattern of 1973-1983 during which American agriculture slid into its worst financial crisis of the past half-century. During that decade, optimistic farmers borrowed heavily on their inflated equity to expand the scale of their operations. What is different now is that lending is based on income, rather than equity, and that is keeping debt ratios in a conservative range (the USDA forecasts an average debt-to-equity ratio of 19.1 for 2002). In the future, it seems clear that debt management will be important as agriculture's income continues to decline and farmers seek the funds necessary to shift into the higher-value crops. Specialty crops require substantially more money invested per acre and that investment is at risk for longer periods of time, raising the risk exposure of the industry.

Concluding Comments

To assess future prospects for farm financial conditions, three topics need attention. (1) Government support: U.S. agriculture's financial condition depends heavily on government support. Direct and indirect government payments have become a significant portion of total farm income in recent years. Those forms of support are unstable in amount and face political scrutiny. (2) Market globalization: Technological advances have created a global market that is providing alternative sources of commodities for U.S. consumers and declining prices for U.S. agricultural producers. (3) Portfolio risk: Cropping pattern changes are making agriculture more risky and having impacts on the value of farmland, but crop diversification is more important. Diversified agricultural producers and geographic regions, like California, have stronger financial conditions, on average. Regions that depend upon a few crops have much more volatility in their income levels.

All three of the topics listed above point to relatively weak future prospects for Midwestern farm financial conditions, compared to the more diversified regions of the country. Midwest agriculture focuses on grain production. Unfortunately, (1) grain crops receive most of the government payments, (2) global grain markets face increasing surpluses, and (3) few Midwestern grain farmers can diversify into other commodities. This means there will be increased income and wealth pressures for producers to diversify into more profitable industries. Thus, America can expect the shift of resources out of production agriculture to continue.

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Faculty Profile

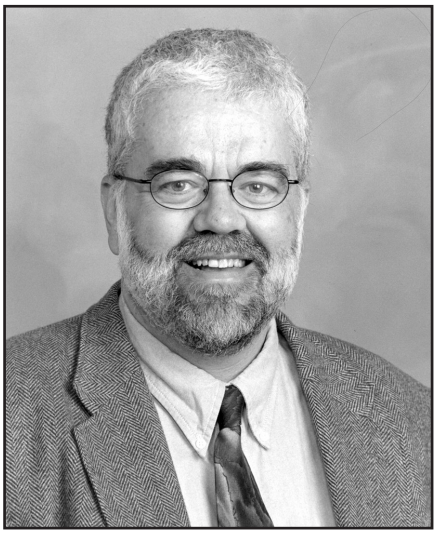
James Chalfant is a professor and chair of the Department of Agricultural and Resource Economics at the University of California, Davis.

Chalfant received a Bachelor's degree from Kansas State University in 1978, and did his graduate study at North Carolina State University, receiving his Ph.D. in 1983. He joined the University of California faculty in the Department of Agricultural and Resource Economics at Berkeley in 1983, and transferred to the Davis campus in 1992. He became chair of the department in 2001.

Chalfant teaches econometrics and does research in a variety of areas within agricultural economics. A common theme in his research is usually the application of statistical and econometric methods to problems in agricultural marketing or demand. Early in his career, Chalfant focused on the econometrics of systems of demand equations, which economists use to model the demands for related goods such as meats and fish. A focus of this work was how to improve estimation methods to obtain better estimates of elasticities of demand, and to test hypotheses concerning structural change in demand.

It was a natural extension of this work to begin to focus on advertising and promotion, which Chalfant and several Davis colleagues have done in a series of recent studies. Previous articles in *Update* have focused on the controversy surrounding generic promotion of agricultural commodities under the auspices of federal or state agricultural marketing orders. One key aspect of the debate over generic promotion is the extent to which it benefits the producers who pay for it. In a study of the effects of promotion by the California Table Grape Commission, Chalfant and coauthors found evidence of substantial benefits to producers (http://giannini.ucop.edu/Monographs/43-grapes.pdf). A later study examined advertising by the California Prune Board (http://giannini.ucop.edu/ResearchReports/344-Prune.pdf).

In joint work with Professors Colin Carter and Rachael Goodhue at UC Davis, Chalfant has worked on a series of topics concerning the California strawberry industry. This work began with an agricultural marketing study, focused on the effects of promotion of fresh strawberries by retailers around holidays such as Easter and Mother's Day. The knowledge gained concerning the workings of the fresh strawberry market has helped with a more recent study, a simulation analysis concerning the effects of the upcoming ban of the fumigant methyl bromide. A study of more recent, interim regulations concerning methyl bromide from California's Department of Pesticide Regulation appears in this issue of *Update*.



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When asked about his work as chair of the department at Davis, Chalfant noted that, on the Davis campus, ARE is known for having a very large and outstanding undergraduate major, Managerial Economics. Chalfant considers the department faculty's success in research, outreach and graduate education to be at least as great as in undergraduate teaching, and considers getting the word out about that success, both on the Davis campus and around the state, to be the most important challenge facing the department.

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