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CALIFORNIA AGRICULTURE

DIMENSIONS AND ISSUES



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CHAPTER 12

California's Edge Problem: Urban Impacts on Agriculture

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Much of California's agriculture operates in the direct shadow of urbanization. In this state, the nation's leader in both farm production and ongoing population growth, the agriculture-urban edge problem has economic, land use, life style, and health dimensions. With so many people living so close to so much commercial farming, the negative impacts flow in both directions. For farmers, operating in the midst of urban neighbors often means reduced productivity and income, regulatory constraints, vandalism, and legal liability. For urban neighbors, the issues concern the dust, noise, odor, and even health affects of living adjacent to industrial-like activities that use chemicals, heavy machinery, and concentrated animal facilities.

The geographical proximity of agricultural and non-farm residents is not a new pattern in California. Edges have existed in this state for the past century and a half, since the development of commercial farming and since European settlers began to build country homes. What is relatively new is the scale and intensity of residential encroachment into rural areas and the further industrialization of farm activities. Just in the half-century since World War II, urban and suburban populations have rapidly spread out and converted close to a million cropland acres, first in coastal agricultural areas and then increasingly in the vast Central Valley. As well as creating numerous edges, this growth brought to rural areas numerous residents with urban backgrounds who, while desiring the amenities of country living, were not acquainted with its discomforts including the industrial aspects of farm practices. At the same time, plant and animal agriculture activities intensified greatly, applying new technologies that increased production but also generated more off-farm impacts. California agriculture during this period also became a more regulated industry, particularly in the use of pesticides and other chemicals and in its impacts on water quality, as a result of the expanded public interest in environmental and health protection.

By now it is a truism in California that the agricultural-urban edge problem is a serious consequence of our continuing urbanization and land use patterns. Along with decrying the urban "paving over" of rich farmland, newspaper accounts frequently document specific examples of edge conflicts between farmers and residential neighbors. In some respects edge conflicts are a more serious California problem than the direct loss of farmland to urban uses. While the farmland conversion rate currently averages about 50,000 acres statewide annually, edge tensions continually affect many times as many agricultural acres.

This discussion, however, is largely informed by anecdotes and impressions. It lacks a body of solid and research-derived evidence about problem causes, circumstances, and solutions. We recognize the widespread existence of the edge problem in California, but we don't understand in a systematic way how it varies in intensity and impacts different communities, farm commodities, urban configurations, and other circumstances. Clearly conflicts and negative impacts are not found in all the places where farming and urban residences are in close proximity; some edges are characterized by a peaceful coexistence between farmers and urban neighbors.

This paper is an exploratory examination of the edge problem in California agriculture that is drawn from a variety of sources. Considering the lack of systematic research in California, some of these sources are studies carried out in other states. We review here (1) available information about the extent of urban-farm borders in the state, (2) the nature of impacts on both sides of the edge, (3) variations in the extent of the problem, (4) farm operator adaptations in urban-influenced areas, and (5) policy and private-sector mechanisms for dealing with the problem.

MORE THAN 10,000 EDGE MILES

Agricultural-urban edges are pervasive throughout California. By one linear measure, in 1998 urban areas throughout the state were bordered by 17,301 kilometers of all kinds of agricultural uses—or 10,726 miles. About two-thirds of this total represented cropland and one-third grazing land. The calculations are based on the digitized

(Geographic Information Systems) maps generated by the Farmland Mapping and Monitoring Program (FMMP) of the California Department of Conservation. Combining soil survey information with the results of aerial photographs, the FMMP every two years maps the agricultural and urban land uses of most of the non public lands territory of the state with an emphasis on tracking farmland conversions to urban use. The estimate of 10,726 miles is probably an undercount of true extent of the total edge distance, since the FMMP does not map a few agricultural areas of the state where modern soil information is lacking, and the mapping does not capture isolated urban pockets of less than 10 acres (the “urban and built-up” map category is defined as at least six structures in a 10 acre area).

This thin, linear measure does not give us a sense of how many farms or how much agricultural land is actually located adjacent to urban uses in California. It is difficult to translate kilometers and miles into a more meaningful area measure, such as acres, without knowing more about farm sizes in relation to linear borders. A conservative estimate is that about 2.2 million agricultural acres statewide are located adjacent to urban edges, based on the assumption that urbanization affects farm operations up to a third of a mile on the average from urban borders. This represents about 8 percent of California’s 28 million total agricultural acres. The same assumption produces an estimate of 1.5 million cropland acres in edge areas, about 13 percent of all cropland in the state.

Table 1. Edge Borders, Population and Urban Acres for Top CA Agricultural Counties

Counties, Ranked by Farm Market Value, 2000	Crop-Urban Border in Kilometers ^a		-----Population-----		-----Urban Acres-----	
	1998	88-98% Increase	2000	90-2000% Increase	1998	88-98% Increase
1. Fresno	788	34.9	779,407	19.7	93,315	21.0
2. Tulare	650	34.5	368,021	17.7	48,522	27.0
3. Monterey	240	25.2	401,762	12.9	50,037	14.1
4. Kern	493	34.4	661,645	21.7	100,779	24.5
5. Merced	489	37.7	210,554	17.9	30,559	46.6
6. San Joaquin	693	15.7	563,598	17.2	71,596	12.2
7. San Diego	409	27.8	2,813,833	12.6	311,491	13.2
8. Stanislaus	486	9.2	446,997	20.6	50,481	17.2
9. Riverside	1,290	25.6	1,545,387	32.0	240,889	28.0
10. Ventura	367	3.5	753,197	12.5	95,522	14.2
11. Imperial	304	20.3	142,301	30.1	23,952	24.4
12. Kings	265	6.0	129,461	27.6	28,244	17.0
Average	539	22.9%	--	20.2%	--	21.6%

a) Calculations of data from the Farmland Mapping and Monitoring Program (California Department of Conservation), prepared by Nick Kuminoff using Arcview GIS 3.2.

Source: California Department of Conservation, Office of Land Conservation, Farmland Mapping and Monitoring Program, county Agricultural Commissioner reports, U.S. Census of Population.

Cropland edges in California are concentrated in the leading agricultural counties—the counties with the highest farm market values and most of the best cropland defined as prime farmland. Table 1 makes this point in examining the edge circumstances of cropland in the 12 top counties in farm market value, including seven Central Valley and three coastal counties. All but the bottom two on the list had market values in 2000 of at least \$1 billion each. Most of the state's urban-cropland borders are found in these high value counties—6,465 kilometers in 1998, or about 90 percent of the state's total. Moreover, they are among the leading counties in prime farmland, 2.6 million acres in 1998, most of the state's total of about 4.3 million prime acres.

Table 1 also notes the large increase in cropland-urban edge borders in the ten years between 1988 and 1998—an average of a 22.9 percent increase in edge kilometers for the 12 counties. This reflects of course the comparable increases in population and urban areas during the approximate or same ten-year periods. However, for several counties—Fresno, Tulare, Monterey, Kern, and San Diego—percentage increases in cropland edge kilometers vastly exceeded the increases in population and acres devoted to urban use.

DIMENSIONS OF THE PROBLEM

Identifying the extent and location of geographical edges tells us little about the incidence and intensity of the conflicts and the specific issues that arise from the close proximity of farms and urban neighbors. We can speculate that such conflicts are concentrated in a relatively few places throughout the state, while farm-urban relations are generally peaceful in most edge areas.

The reasons are that urbanization proceeds at varying rates in different communities, farmers generally adjust their operations to edge realities, and most residential neighbors learn to tolerate some discomfort from nearby agricultural operations as the price to pay for living in the countryside.

Still there is substantial anecdotal information about the types of impacts that qualify as edge problems. The common understanding in California's agricultural areas is that farm operators and residential neighbors are affected in particular ways by their respective behaviors. As duplicated in Table 2, a short list of such issues was included in the summary report of the 1996 conference, *California's Future: Maintaining Viable Agriculture at the Urban Edge*, organized by the UC Agricultural Issues Center. Longer lists of edge issues are found in other reports, including those issued in other states. A New York State guidebook on reducing edge conflicts, for example, identifies 26 different kinds of rural residents' complaints against farmers, including unsightly farmsteads, trash, inconsiderate behavior by farmers, and wandering livestock (Farming Alternatives Program, p. 5).

What is clear from Table 2 is that farmers and residents at the edge differ in their interests and views of how they are negatively affected by their interactions. For farmers, the issues largely concern the costs and efficiencies of producing their commodities—largely economic considerations. For residential neighbors, the impacts deal with questions of health (particularly concerning the application of pesticides and other chemicals) and quality of life. This difference in how edge issues are defined by

the respective parties suggests how difficult it may be to resolve such issues when conflicting positions are strongly held.

Table 2. Edge Problems Frequently Cited by Farmers and Urban Neighbors

Farmers	Urban Neighbors
Restraints on what otherwise would be routine practices such as spraying and cultivating.	Pesticide use, particularly drift problems.
Liability for trespassers.	Nighttime farming—lights and noise.
Theft, vandalism, litter.	Odor, particularly from livestock operations and food processors.
Damage from dogs.	Dust and smoke.
Imported pests—for example, weeds spreading from urban areas.	Flies, mosquitoes and other pests.
Increased traffic on local roads.	

Source: Coppock and Kreith, 1997.

Edge issues are expressed in local settings and frequently in personal terms. A sampling of recent newspaper accounts throughout California presents these examples:

- Horrified when viewing the castration of calves on the adjacent ranch, a rural resident of El Dorado complains to the rancher who then reports this as harassment to the sheriff's office (Leavenworth, 2000).
- In the Rosedale area immediately west of Bakersfield in Kern County, a neighborhood of alternating farms, rural residents, and new residential subdivisions, a rancher reports the vandalizing of a well pump three times in a short period, chasing cars and motorcycles through his orchard, and thefts of tree produce (Prince, 1994).
- Largely because of the displacement of their operations by urbanization in southern California, dairymen propose new or enlarged mega-dairies with herd sizes exceeding 8,000 cows in the southern San Joaquin Valley. Environmentalists and local residents strongly oppose these proposals, citing water quality, odor, and other issues (Sokoloff, 1999).
- Farmers in an area of San Luis Obispo County, concerned about restrictions on their pesticide spraying and increased local traffic, protest school district plans to locate a new high school in their area (Ome, 1998).

Variations in Extent and Intensity: Farm Commodities and Practices

Obviously edge issues are not equal in their distribution and how they are perceived by the parties to these conflicts. We expect the extent and intensity of edge problems to vary from location to location, depending on the characteristics of both the agricultural and urban sides of the boundary. Critical agricultural variables are the types of commodities grown and the farm practices used to produce them. In California, conflicts over the agricultural use of pesticides and herbicides seem to be more visible and widespread than in most other farm states. Our state specializes in tree, vine, and vegetable crops that require extensive cultivation and protection from pests. Much of the production of such crops occurs in edge areas, where high costs for purchasing or renting agricultural land impels operators to grow high value and high yield commodities.

What may limit in many localities the extent of neighborhood opposition to farm use of pesticides and other chemicals is the tight regulation of such applications by state and local governments in California. Human health risks and potential water contamination are controversial issues. Regulation takes place primarily through the permitting actions of county agricultural commissioners, the licensing of applicators, and the work of county health departments. Despite these controls, excessive drift from aerial and ground spraying is an ever-present concern. Residents in some agricultural communities, either attributing specific health problems to spray drift or fearing the risk, have organized to protest chemical use and to question the adequacy of the regulatory system (Phillips, 1997; Van Driesche, 1987).

In many other states the most conflictual farm-urban issues increasingly revolve around the location and effects of concentrated animal feeding operations, a type of agricultural activity that now has its own acronym—CAFOs. Reflected here is the growing industrialization of animal agriculture in the nation, marked especially by the trend in southern, eastern, and midwestern states to larger and more specialized hog and poultry raising operations (Castle, 1998). Local operators typically are integrated via contractual arrangements into the feed, processing, and marketing processes of national firms. From a community and environmental perspective, the most critical feature of these factory farms is the concentration of so much animal waste in such small areas—the “piling up of too much stuff in one place” according to one observer (Schwab, 1998, p. 2). The threat to surface waters and aquifers is the central issue. Public agencies are not always aggressive in controlling the siting of such farms and in overseeing their waste disposal processes. CAFOs also generate other negative impacts in their neighborhoods, primarily odor and air pollution.

The California version of the CAFO problem largely involves the development of larger dairy farms. As noted above, this is a major public policy issue in the southern San Joaquin Valley, now the most productive milkshed in the nation. County governments through their planning and land use powers are largely responsible for controlling the location of new or enlarged dairies, while the water quality aspects of dairy operations are in the hands of environmental regulators in state and federal governments.

Variations in Extent and Intensity: Urban Perceptions and Configurations

The key variables on the urban side of edge areas are the characteristics of residents and the configurations of their urban neighborhoods. Certainly the negative impacts of living next to certain kinds of intensive farming operations have a clear and objective reality. Nobody likes dust on their backyard laundry, to be awakened at 5 a.m. by the sound of heavy machinery, or to be subject to possible exposure to the drift from chemical applications. Yet, perceptions also determine how people personally regard and react—or don't—to such conditions. Levels of tolerance to farm operations vary quite a bit, with some urban neighbors more disposed than others to identify specific incidents as more than minor annoyances and more inclined to complain to farmers and government offices.

What seem to generate such perceptual differences, according to anecdotal information, are lifestyle backgrounds. The generalization is that newcomers who move to agricultural locations directly from urban areas are less tolerant of the discomforts of living close to farms than longtime residents who have farm or other rural backgrounds (Van Driesche, 1987). Particularly contributing to the unhappiness of urban newcomers with their new neighborhoods is how the realities of intensive agricultural practices clash with their expectations of pleasant living in the country. Notes the mayor of Patterson, an expanding small city in western Stanislaus County: "Most of us have grown up with crop-dusters at dawn, but not the new constituents" (Morain, 1991). Lacking so far systematic research on the topic, this generalization about levels of tolerance is merely a reasonable hypothesis.

The configuration of residential neighborhoods in edge areas also likely affects the extent of conflict. The larger the exposure or interface between farm activities and nonfarm residences, the more opportunity for problems. By implication, this is an argument for planning and residential design that confines urban development in relatively small blocks, as compared to a pattern of scattered homesites throughout an agricultural area. The difference is between sharp, solid edges separating farms and residences and ill-defined and fragmented edges that blur the distinction. A separate kind of problem is posed by the location in the middle of agricultural areas of schools, churches, and other facilities that concentrate large numbers of people at certain times.

The Impermanence Syndrome

As well as immediate impacts, there are also long-term consequences for agricultural operations located in areas of ongoing urbanization. Some writers refer to the "impermanence syndrome," a term which takes in a variety of meanings, but generally suggests a high degree of uncertainty among farmers about their ability to continue productive operations in areas beset by rapid population increase and land use change. Anticipating either that they will have the chance to sell their land for development or that surrounding urbanization will restrict their farming activities, farmers in such situations avoid continuing investment in their enterprises with capital improvements, new technologies, and management time and energy. This uncertainty about the future may in fact serve as a self-fulfilling prophecy, pushing landowners to seek development deals and thus accelerating the rate of farmland conversions in high growth areas. In the interim, much farmland may be idled or underutilized, production shifted from

more to less intensively cultivated crops, and individual farm parcels bypassed or surrounded by development. For California farmland owners, the annexation plans of nearby cities are a key sign as to whether or not agriculture is likely to survive in particular areas (Pandol, 1997). Research in other states suggests that urban-related uncertainties often lead to inefficient land use (Berry and Plaut, 1978; Larson, Findeis and Smith, 2002; Lockertz, Freedgood and Coon, 1987; Zollinger and Krannich, 2002).

FARM OPERATOR ADAPTATIONS

Not all agricultural landowners in edge locations give up on the future, accepting what others regard as the inevitable demise of productive farming in their areas. There are sufficient stories of individual farmers continuing to invest in and aggressively manage their edge properties to suggest that continued farming in the shadow of urbanization is an important pattern for California agriculture. One reason is that not all edges experience ongoing development pressures. Even in high growth regions, California cities do not grow out in all directions at the same time; rates of expansion also are often gradual, allowing years of stability to some edges. Some landowners thus are unrealistic in anticipating that the path of urban expansion in their area will give them the near-future opportunity to sell their land for development. In a guide to the easement option for California agricultural landowners, the authors estimate that more than three-quarters of Central Valley farmland "cannot realistically be expected to develop to urban uses within the next 40 years" (Kirkpatrick, Kozloff and Berwald, 2001).

Yet even in stable edge areas where agricultural operations are likely to continue indefinitely, the very proximity to residential and other urban land uses usually requires some degree of adjustment on the part of farmers. Operating in the shadow of urbanization demands more in farm management skills and the use of technology, according to some accounts. These abilities and the willingness to adapt and continue to farm in urban-influenced areas are not equally distributed among farmers in such locations. Age and family circumstances play a role. A study of dairy farms in a Hudson Valley area of New York experiencing growth pressures, finds that younger operators with fewer family problems were more likely to stay in business at that location and adapt their operations to the urban environment (Hirschl and Long, 1993).

Adaptations include various kinds of changes in production practices to minimize negative impacts on urban neighbors and to secure crops and equipment from vandals and trespassers. Integrated Pest Management (IPM) techniques for reducing or controlling the use of pesticides and other chemicals are widely used by California farmers, drawing from a large body of university and private sector research. IPM covers both biological and engineering innovations, including investment in new spray equipment (Phillips, 1997). Other changes include muffling pump motors, measures to reduce dust, and avoiding late-night and early morning operations that are noisy. Because of these and other adaptations, production costs for edge farming are usually higher than in other locations, whether because of equipment investment or the inefficiencies created by operational changes.

One example of urban-influenced adaptation is provided by the experience of Southern California's poultry farmers during the 1980s. They invested in new types of buildings to remove laying hens from the floor and thus isolate waste material, changed procedures for drying and disposing of waste, landscaped the areas around poultry housing, and improved fencing and installed alarm systems to reduce vandalism and theft (Roger-Reynells, 1997). Some poultry farms in the region chose instead to sell their land for development and relocate in more remote locations, investing some of their proceeds in new facilities—the ultimate strategy by farm operators impacted by urban growth.

High Value Crops in Metropolitan Counties

A different kind of adaptation among edge growers is to change the commodities grown. Generally this means shifting to higher value commodities, or to those that are less vulnerable to urban impacts. Commodities that produce more income per acre, such as tree, ornamental, and vineyard crops, also typically involve more intensive and expensive cultivation practices. But the motivation for shifting in this direction is the already higher costs of farming in urban-influenced areas, including the land costs for farms that acquire more land to expand their operations (Coppock and Kreith, 1997).

Such adaptations allow some productive and profitable agricultural operations to continue in locations highly impacted by urban growth. This is suggested by changes in farm operations in several of California's largest metropolitan counties recorded in the half century between 1950-2001, a period of considerable population growth and farmland conversion. Table 3 shows the changes during this period in population, agricultural market value, and top four farm commodities for five of the state's eight counties with more than 1 million residents (as of 2001).

Located in coastal areas, they include the four most populous counties (Los Angeles, Orange, San Diego, and Santa Clara) of California. All five counties recorded a substantive shift in dominant commodities over the half century, with nursery products or flowers taking over the top spot. Citrus, poultry, dairy products, and field crops—ranking commodities in 1950—were largely eliminated from the top four spots by 2001. The significance of the shift to nursery plants is that they are often grown in greenhouses, enclosed environments that limit impacts on urban neighbors and are relatively secure from vandalism and other encroachments. Nursery products also have a ready market in nearby urban areas.

Table 3 also reveals the continued importance of agricultural to local economies in four of these metropolitan counties. With the exception of Alameda, all had farm market values of at least \$250 million in 2001. Even Los Angeles County made this list in 2001, due to \$152 million in nursery sales, although the agricultural significance of this most populous California County dropped greatly from the late 1940s when it was the state's (and the nation's) top producer in market terms. In 2001 Los Angeles ranked 27th in farm value among California's 58 counties.

San Diego County stands out as the only county in this sample with an increase in farm market value during 1950-2001 (+1718%) that exceeded the rise in California's consumer price index (+696%) during this half-century. In 2001 San Diego ranked

eighth in the state with a market value of \$1.3 billion, fueled by more than \$700 million in nursery and flower production and \$138 million in avocados.

Table 3. Agriculture in Metropolitan Counties, 1950-2000

Population (million)	Alameda County	Los Angeles County	Orange County	Santa Clara County	San Diego County
1950	.740	4.151	.216	.290	.556
2000	1.440	9.519	2.846	1.682	2.814
<i>Agriculture Market Value (\$ million)</i>					
1950	33.2	95.4	79.2	84.1	70.9
2001	36.5	258.2	319.0	288.1	1,289.6
% Increase	9.9%	170.4%	302.7%	242.5%	1,718.0%
<i>Top Commodities</i>					
1950	1. Vegetables 2. Nursery 3. Poultry 4. Dairy	1. Citrus 2. Nursery 3. Vegetables 4. Field Crops	1. Citrus 2. Dairy 3. Field 4. Poultry	1. Fruits-Nuts 2. Beef 3. Vegetables 4. Poultry	1. Vegetables 2. Dairy 3. Poultry 4. Eggs
2001	1. Nursery 2. Grapes 3. Cattle 4. Flowers	1. Nursery 2. Vegetables 3. Fruit 4. Onions	1. Nursery 2. Strawberries 3. Tomatoes 4. Avocados	1. Nursery 2. Mushrooms 3. Peppers 4. Flowers	1. Flowers 2. Nursery 3. Avocados 4. Eggs
Source: Annual reports, county Agricultural Commissioner reports; U.S. Census of Population.					

In pointing to the survivability of farming in metropolitan areas, however, these numbers are more suggestive than conclusive. The “metropolitan” designation is only a rough and imprecise indication of the extent to which local agriculture is influenced by urbanization. The counties in this small sample in fact contain vast rural areas, leaving open the possibility that many of the most productive farms are not close to urban development. Also not examined in this analysis is the extent to which commodity shifts are the result of other factors, including market forces and water supply.

The Advantages of Urban Proximity

Research in several eastern states supports the survivability thesis for urban-influenced farming. The common generalization from several studies is that urban proximity can provide profit-making opportunities as well as problems for farmers, considering the potential for direct marketing, other forms of access to urban consumers, and off-farm income for operators. (Edelman, et al., 1999). But only certain kinds of intensely-cultivated farms, including vegetable producers, seem to benefit from such locations (Larson, et al., 2001). A USDA review of the available information on farms in metropolitan areas characterizes them as smaller, producing

more per acre, more diverse, and more focused on high-value production than farms in non-metropolitan areas (U.S. Department of Agriculture, 2001).

POLICIES AND TOOLS FOR RESOLVING EDGE PROBLEMS

California has a large array of tools for dealing with and resolving edge issues, as displayed in Table 4. Some are implicit in the policies and regulatory actions of city and county governments, the public agencies given the authority in state law to control land use. Others involve practices in the private sector that attempt to bridge the gap between farmers and urban neighbors.

Table 4. California Strategies for Reducing Urban-Agricultural Edge Conflicts

<i>Land Use Policies and Tools</i>
1. Concentrate urban growth in cities and other existing urban centers
2. Limit new residences in agricultural areas
3. Efficient urban development—high density projects
4. Cluster development
5. LAFCO (Local Agency Formation Commission) control of city annexations
6. County-city agreements on the direction of urban development
7. Environmental review of proposed development and mitigation of farmland impacts
8. Agricultural Buffers
9. Agricultural zoning
10. Design urban neighborhoods and homesites to limit exposure to nearby farmland
11. Build new communities on poor farm soils
<i>Farm-Neighbor Practices</i>
1. Right-to-farm ordinances
2. Regulation of chemical use in farm operations
3. Clean water requirements for animal facilities
4. Conflict resolution procedures
5. Conflict prevention—good neighbor communications and accommodation
6. Agriculture education for urban residents

Source: Sokolow, 2002.

Land Use Policies

Land use policies and regulations can be seen as largely proactive efforts to direct the location and form of new urban development in ways that would minimize impacts on agricultural activities. This is the general intent of policies that call for keeping

development away from agricultural areas, in particular restricting residential growth in the countryside and directing it instead to existing cities, either as infill development or as incremental additions to municipal areas as cities gradually annex adjacent territory. Some conversion of farmland is inevitable in this process where cities are surrounded by agricultural uses, as throughout the Central Valley. But the assumption is that this is preferable to allowing building in unincorporated areas, because city development occurs at relatively high densities that convert less farmland in relation to population housed, it is less costly in public infrastructure terms, and it is more likely to produce solid and less exposed edges with farming. Also cities that are surrounded by agricultural land of varying quality and productivity have the option of directing their expansion away from the best farmland.

City-oriented growth strategies are supported by the LAFCO process and county-city agreements on the location of future urban development. LAFCOs (Local Agency Formation Commissions) are California's boundary control agencies at the county level, semi-independent boards that have the power to review, deny, or change city plans to annex territory and to designate their future growth areas (spheres of influence). LAFCO actions, guided by orderly growth and farmland projection objectives, are a major restraint on extensive sprawl. Some counties and cities in agricultural areas have negotiated agreements that divert urban development from unincorporated areas to city areas, usually in return for financial considerations that allow the county to share in municipal growth revenues (Sokolow, 1997).

The two land use policies that most specifically address edge issues are agricultural buffers and mitigations imposed on new development for the loss of farmland or to limit negative impacts on farming. The two are closely related, since buffers are a type of mitigation frequently recommended by the environmental reviews (under the California Environmental Quality Act—CEQA) conducted by county and city governments of proposed urban projects. Buffers essentially create a separation between agricultural and urban uses, using barriers or distance to minimize negative impacts on both sides of an edge boundary, especially the effects of chemical drift from farming activity.

Agricultural buffers come in different forms—natural barriers created by landscape features such as waterways, roads, landscaping, walls, residential setbacks, open space greenbelts, and combinations of various types. Key issues in their design and creation are their permanence, maintenance, and which landowners—developer/homeowner or farmer—provide the land or barrier. Although the general plans of many California counties and cities call for use of buffers to protect farmland, the implementation of the technique and application to specific urban projects is quite spotty, as Mary Handel noted in a 1994 M.S. thesis in Community Development at UC Davis. Especially controversial are the desired widths for setbacks and greenbelts, with farm chemical applicators and other agricultural experts calling for the biggest possible separations while urban developers and city governments argue for smaller widths because of land cost considerations. In Handel's study of buffer use in 16 counties and 6 cities, designated widths range between 50-800 feet. She also finds great variations among farmers and urban neighbors in the perceived effectiveness of different forms of buffers to limit specific negative impacts. For example, farmers generally judge setbacks or open space buffers as ineffective in

dealing with trespass, vandalism, litter, theft, and dogs while urban residents see them as generally effective in reducing chemical drift, odor, and dust from farm operations (Handel, 1994). More recently, the Great Valley Center published a short guide on agricultural buffers for urban planners (Great Valley Center, 2002).

Farm-Neighbor Practices

As contrasted with the land-use control approach of trying to head off edge problems by influencing the location and design of urban development, other strategies seek to deal more directly with farm-urban neighbor tensions, often after they have emerged. Government policies and programs in this category include right-to-farm ordinances, California's extensive regulation of pesticides and other agricultural chemicals, and restrictions on farm animal facilities driven by clean water policies.

When first adopted by California local governments in the late 1980s after enabling state legislation, right-to-farm ordinances were seen as a promising tool for protecting routine farm operations from nuisance law suits and complaints by urban neighbors. The central feature of most such local laws is a disclosure requirement—notifying homebuyers of parcels adjacent to farms of the possibly negative effects of agricultural operations. In this way, the assumption goes, new residents especially would learn about the realities of modern farming and would be less inclined to complain or even go to court over sprays, dust, odors, noise and other results of nearby agriculture. Some ordinances also provide procedures for handling formal complaints by neighbors.

Most California counties and a number of cities now have right-to-farm ordinances, a popularity seemingly driven by the belief on the part of local officials and others that this is an easy way to provide farmland protection that avoids hard political choices. (Right-to-farm is also a common technique in other states.) Because they are not regulatory tools and rely primarily on the dissemination of information, however, the ordinances lack teeth and legal effect. It is uncertain to what extent they have reduced conflicts in edge areas. But the ordinances do serve a useful purpose, according to many agricultural leaders and county officials, in educating residents and asserting as a policy matter the value of agriculture in particular communities (Wacker, et al., 2001).

More generally, conflicts between farmers and urban neighbors over farm activities can be addressed by a variety of techniques for dealing with community-level disputes. Practitioners in this field make a distinction between conflict resolution and conflict prevention. Resolution processes often involve a form of third party mediation, in which facilitators get both sides together, factual information on the source and elements of the dispute is developed, alternatives are deliberated, and an effort is made to reach an agreement among the parties as to actions to be taken such as changes in farm management (Abdalla and Kelsey, 1996). The state of New York has formalized such processes, with a Community Dispute Resolution Center in each county with resources for dealing with edge and other local conflicts (Farming Alternatives Program, n.d.).

Preventing edge conflicts typically involves less formal methods, with the emphasis on encouraging farm operators to maintain open lines of communication with

their urban neighbors. The assumption is that friendly relations can head off serious disputes in the future over specific matters. One piece of advice to farmers in a New York state guidebook on reducing edge conflicts is to notify neighbors in advance of the timing and need for particular practices that may generate negative impacts. The guidebook goes further to suggest 15 strategies that farmers can use to foster good neighbor relations, including farm tours, providing gifts of farm produce, and setting aside an acre or two for wildlife (Farming Alternatives Program, n.d.).

SUMMARY: RESEARCHABLE QUESTIONS

As new residents steadily move into rural areas, the extent of the farm-urban edge problem increases in California. Our rough estimates place the total linear scope of agriculture-urban edges at more than 10,000 miles throughout the state, increasing by 23 percent in the ten year period of 1988-98. Agriculture is increasingly impacted by this exposure to urban populations, leading to restrictions on farm productivity and efficiency. The negative effects flow in the other direction as well, since the industrial-type processes of California agriculture are incompatible with residential comfort, quality of life, and even health.

It is misleading to generalize the dimensions of the problem, since edge circumstances vary greatly depending on commodities grown, differences in farm cultivation and management practices, the configurations of urban neighborhoods, and perceptions of both residents and farmers. A further complication is that management changes and commodity shifts allow some edge farmers to adapt successfully in urban-influenced areas.

All of this suggests a currently inadequate knowledge base for understanding the problem and searching for the most effective solutions. Achieving edges that allow the stable coexistence of farms and urban neighbors calls for a combination of public policy measures, farm management practices, and human behavior. A short list of the key questions for building the knowledge base include the following:

1. What are the full dimensions of the farm-urban edge problem in California? Is it possible to generalize about location, causes, and circumstances—or to classify these specifics into meaningful categories and variables that point the way to solutions?
2. How can proactive planning and land use regulations minimize future edge problems in the location and design of urban uses near agricultural areas?
3. What educational and political strategies can help implement effective edge policies at the community level?
4. For farm operators, what management strategies and cultivation techniques are most cost-effective for adjusting to edge constraints, and under what conditions?
5. Beyond such management adaptations and their required adherence to applicable regulations, what can farm operators do to bring about more positive relations with urban neighbors?

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