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Is America Running Out of Farmland?

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In 1981, the inter-agency National Agricultural Lands Study (USDA and CEQ, 1981) triggered a vigorous debate about the disappearance of American farmland. Although the dire predictions of the 1981 study—it projected a need for 77 million additional agricultural acres by the year 2000—did not come true, a recent article by Francis et al. (2012), shows that the more alarmist view about farmland that was common in the 1970s and 1980s is alive and well.

Francis and his co-authors argue that we face farmland challenges today that we did not have to deal with 40 years ago. Although they ignore some reasons for optimism, such as increases in yields from genetically-modified seeds, there is little doubt that most 21st century trends affecting the long-run availability of farmland are troubling ones. A list of such trends would include global demand side pressures--international development and greater consumption of land-intensive meat products and the perpetual concern over global population growth—and global supply side pressures—environmental degradation, climate change, alternative use of land for biofuels, and diminishing returns from traditional cross-breeding technologies. Regarding urbanization, the threats of sprawl continue and its potential to pave over especially productive farmland that is located near sites of original colonial settlement with favored floodplains and well-watered, flat soils near water transportation. The local food movement has brought new opportunities for farming that are close to, and in some cases entirely within, urbanized areas. This social trend was not foreseen at the time of the 1981 Agricultural Lands Study. It offers some hope for the preservation of high-quality agricultural land, provided that: (1) it allows farmers to outbid developers for at least some urban parcels that would otherwise have been developed or (2) it adds previously developed land, such as distressed properties in central cities, to the agricultural land base and proves that farming can take place efficiently there.

State and local farmland preservation programs, as well as the federal Farm and Ranch Lands Protection Program of 1996, were designed largely to protect farmland resources from urban encroachment, following the call to action of the 1981 agricultural lands study. What has been learned about the relationship between urban expansion and long-run farmland availability in the United States? Has the threat posed by development changed over the last thirty years? The short answer is that the threat to America's agricultural land base from development remains long-term and speculative rather than urgent. Where domestic food supply is concerned, issues like water supply and soil erosion are more pressing. Agricultural markets continue to be characterized by long distance shipping, while the price and use of suburban parcels is determined today by local factors, especially the demand for urban uses.

None of this is to say that state and federal policy makers should not plan for extreme contingencies, like those related to climate change or a sharp increase in transportation costs. State and local policy makers, meanwhile, will continue to respond to local voter demands for open space, sprawl control, and maintenance of a land reserve for local agriculture.

Urbanization and Prime Farmland

The most commonly used definition of high quality agricultural land in the United States is the prime farmland

category of the U.S. Department of Agriculture's Natural Resources Conservation Service (NRCS). Prime farmland is defined by the NRCS as land that "has the combination of soil properties, growing season, and moisture supply needed to produce sustained high yields of crops in an economic manner if it is treated and managed according to acceptable farming methods" (USDA, 2014). By this definition, 23% of the non-federal open land in the continental United States qualified as prime farmland in 2010, whether or not it was used to grow crops (USDA and ISU, 2013).

Although the prime farmland designation is widely used to measure land that deserves the highest-priority protection, it should be remembered that land classifications are not immutable—poorer land can become "prime" when irrigated— and there is considerable local and regional variation within the prime category.

Vining, Plaut, and Bieri (1977) confirmed that prime farmland was disproportionately located in or near the nation's largest metropolitan areas, although they described the relationship as "modest." These authors observed large differences, however, in the co-location of prime farmland and urban settlement across U.S. census regions. This means that the loss of prime farmland to urbanization could be far worse in New Jersey than, say, Georgia—even if population growth rates were the same. Of course, state population growth rates are not the same. This fact must also be taken into account when analyzing—or forecasting—the loss of prime farmland in different parts of the country.

The 2010 National Resources Inventory (NRI) of the NRCS (USDA and ISU, 2013) allows a fairly precise and updated estimate of the rate of loss of various types of land due to urbanization, because it reports the amount of each undeveloped land type *remaining* in each survey year (Table 1). The data on remaining rural acres are available for each of the lower 48 states for seven years between 1982 and 2010. The first row of Table 1 reports data for the entire United States. Because local conditions vary widely, the remaining rows report data on a set of representative states from different census regions throughout the United States.

The first column of Table 1 shows the percentage of undeveloped, nonfederal land in each state that was characterized as NRCS prime farmland in 2010. The second column shows the percentage decline in prime farmland in each state between 1982 and 2010. The third column shows the percentage decline in available rural acres of all types, including forested, that could be used to raise food or livestock if needed.

Northeast states have seen much of their farmland revert to forest over the last century; there is no reason why we could not reclaim some of this land for food production if necessary. Having said that, it must also be acknowledged that a significant portion of today's forests are on steep slopes or are regarded as necessary for

Table 1. Decline of nonfederal land currently in or available for agriculture: Prime farmland, all rural land, and land not forested

		Percentage decline in land area (10-year average 1982-2010)			
		Percentage of usable open land that is prime farmland	Prime farmland	Rural open land	Non-forested open land
Continental United States		23.3%	-1.6%	-1.3%	-1.8%
Mid-Atlantic region					
	New Jersey	22.5%	-10.8%	-8.0%	-13.7%
	Pennsylvania	14.8%	-4.5%	-2.4%	-6.7%
Great Lakes region					
	Ohio	52.8%	-2.4%	-2.1%	-3.0%
	Michigan	26.1%	-2.2%	-1.8%	-4.0%
Southeast region					
	Alabama	22.4%	-3.0%	-1.8%	-6.3%
	Georgia	23.7%	-2.6%	-2.9%	-9.2%
Plains region					
	Iowa	55.1%	-0.4%	-0.4%	-0.4%
	South Dakota	14.6%	-0.7%	-0.2%	-0.2%
Southwest region					
	Arizona	1.6%	-14.2%	-0.8%	-0.5%
	New Mexico	0.3%	-11.5%	-0.2%	-0.3%
Mountain region					
	Idaho	16.8%	-3.1%	-0.8%	-1.0%
Pacific region					
	California	12.2%	-4.7%	-2.5%	-3.0%

Source: USDA Natural Resources Conservation Service, 2010 National Resources Inventory, tables 2, 12.
Note: Usable open land is estimated as total rural land minus "other rural land." Other rural land is either covered by rural structures or is rocky, swampy, or barren therefore not usable without significant improvement.

wildlife preservation, carbon sequestration, or other environmental services. For this reason, Table 1's final column shows the percentage decline due to urbanization of all non-forested, open rural land that existed in 1982. Together, the three right-hand columns in Table 1 span a range of subjective definitions of open land that should be used, or considered a reserve, for agricultural production in the United States.

The first thing to notice in Table 1 is that prime farmland has been declining more rapidly than all rural by development, economic incentives cause "forest, pasture, range, and other rural land [to be] converted to cropland," thus reducing the net effect on food supply (Heimlich and Krupa, 1994). The existence of market forces means that straight-line forecasts are unlikely to come true; still, they can provide an intuitive sense of the urgency of farmland loss in different locations.

For the continental United States, a straight-line projection technique suggests that prime agricultural land would be completely eliminated in appears to have some holes in it. A quick look at maps published in the 2013 NRI report shows that Iowa is the continent's epicenter for "sheet and rill erosion" producing sediments that flow down the Mississippi River. This fact should remind us that prime U.S. farmland can disappear for reasons other than urbanization. In Iowa, continued availability of topsoil is the chief threat; in Florida, inundation from rising sea levels might be considered, alongside urbanization. In California, farms in the state's famed central valley could run out of

A Prime Farmland Risk Profile for the 48 Contiguous States

There are different ways to characterize the risk to farmland from urbanization across states, and therefore where to prioritize preservation efforts. For example, we might ask the question: Which states have a high percentage of farmland that is designated prime? Other things equal, these are places where a state-level preservation effort would have the greatest impact on prime farmland, viewed nationally. Figure 1 shows that these states cluster in those parts of the country with sufficient rainfall, drained by large river systems, and with land that is relatively flat.

But Figure 1 ignores the threat to this prime farmland that is generated by urban growth. Figure 2, therefore, shows housing growth over the same period for which farmland decline is measured in the 2013 NRCS report. This map shows the well-known sunbelt/west coast growth phenomenon of the last several decades. It is silent, however, on whether growth in a given state is eliminating prime farmland at a faster rate than other kinds of rural land.

Figure 3 addresses this third question—while ignoring the first two. It shows states that rank above the median on the ratio of prime farmland decline to decline of all rural land. These are states where prime farmland is disproportionately in the path of development, viewed independently of the speed of that development.

In the west, Figure 3 looks similar to Figure 2. Not only has the West been growing rapidly, it is also understandable that western cities were founded close to this region's very limited stocks of prime farmland.

Comparing the Northeast and Southeast regions in Figures 2 and 3, however, leads to the conclusion that states losing prime farmland more rapidly than other rural lands—generally in the Northeast—are not the states that have grown most rapidly, which are generally in the Southeast. States with a disproportionate quantity of prime farmland do not align neatly along north-south lines which can be seen in Figure 1. Having said that, it is clear that northeastern states with slower long-term growth rates but greater relative risk to prime farmland have been more actively preserving land than their southern counterparts (AFT, 2005).

Are there any states that rank high on all three farmland preservation risk factors? Yes, there are two: Texas and Alabama. Neither of these states made AFT's 2005 roster of states authorizing and using state funds for preservation (AFT, 2005). A likely explanation is the South's small-government political culture. Private foundations may be picking up some of the slack by purchasing conservation easements in these two states.

relatively few fruits and vegetables sold in America's supermarkets today are local, such high-value crops could potentially be grown on the fringe of any metropolitan area even as this fringe moves outward.

An important reason for this is that prime farmland is not strictly required to grow fruits and vegetables. In fact, as noted by a reviewer of this article, high-value fruit and vegetable crops often require soil characteristics that preclude a soil from the prime designation. Given the high water content of these commodities, access to water for irrigation is a more important spatial resource than a particular type of soil or access to adjacent urban markets. California's Central Valley, a global exporter of fruits and vegetables that is removed from the state's largest cities, is now putting this constraint to the test.

Will Urban Sprawl Continue in North America?

The U.S. Department of Housing and Urban Development (HUD) journal *Cityscape* recently commissioned a set of essays on the question of whether Americans would live more or less densely in the future (HUD, 2013). A key question raised by the authors was whether residential preferences in North America would change with a continued increase in incomes. One scenario assumes that consumers will demand homes closer to their jobs, with walkable neighborhoods and city amenities. A continuation of the historical trend toward more personal open space in back and side yards, however, is also logical. Affluent homebuyers could eventually split into high- and low-density groups, based on personal consumption preferences.

Other factors in this debate include the aging of the population, leading to higher density housing; lack of funding for highway construction, which will limit one important driver of past decentralization; and crosscutting preferences by modern industry for urban agglomeration on the one hand, and telecommuting or back-office development on the other. Interestingly, the possibility that high food and agricultural land prices might "push back" on the urban-rural boundary, leading to higher residential densities, is not mentioned in the symposium issue.

In the aggregate, the *Cityscape* forecasts predict a slowed-down continuation of sprawl in North America, with a lot of density variation and experimentation within metropolitan areas. Metropolitan areas will still be quite large and will, in some areas, bleed into each other. That being said, forecasts of urban densities and the overall urban footprint in the United States and other developed countries vary widely. Ironically, this is also true of forecasts of future cropland demand in North America under—and even without—considerations of climate change (Schmitz et al., 2014; Hertel, 2010). At some level, then, we simply do not know what our land use future will look like, other than the safe bet that urban land will constitute a small minority of the continent's land mass for many years to come.

Farmland Protection and Public Policy

Even if you are not an economist, the market paradigm remains an important starting point for thinking about farmland preservation policy. Some economists and planners are perfectly happy with the land use choices the market appears to be making today (Gordon and Richardson, 1997; 2006). When an acre of farmland is lost, these authors argue, it is because housing was the "best and highest use" for that parcel at that particular time. More specifically, the foregone opportunity of using prime farmland for agricultural production is already captured in today's price, so the development of such a parcel cannot possibly be a problem. Working on its own, the market gets the right answer.

This argument would be sound if land could move in a costless way back and forth between urban and rural uses in response to new market information. The common assumption that urban development is irreversible, however, leads to an "option value" argument that tends to support the preservationist point of view. If too much land were developed, advocates argue, we would lose the option to use it as a cushion against global famine. The opposite mistake—having insufficient land for development because too much is being cultivated—is both harder to imagine and easier to reverse. Sure, some consumer satisfaction is lost by constraining development today, but isn't food ultimately more essential to life than an extra thousand square feet of home or lawn?

A second economic rationale for farmland preservation begins with the premise that development is characterized by numerous market failures today, leading to the conclusion that our urban landscapes sprawl inefficiently. Brueckner (2000) provides a nice summary of these market failures, without concluding that they are severe enough to justify massive planning controls. One such failure, which might actually be the crucial one, is that there exists no private market in which citizens can purchase open space and amenity services from their farmer neighbors. Farmers therefore lack any incentive to provide these services by postponing development. Indeed, the 40-year-old public market, in which taxes are used to purchase development rights on farmland, can be viewed as a collective stand-in for this non-existent private market for local amenities. It is supplemented by a private, nonprofit market for open space. Taken together, there is no guarantee that these programs serve the multiple

demands of residents as well as a formal market for ecosystem services, or even greater central planning, would.

Perhaps easier to deal with are those cases where misguided government policies, not failures of the free market, are to blame for the rapid pace at which we chew up our farmland. Why, for example, would anybody think that a zoning ordinance specifying a minimum residential lot size of five acres is a good thing? There is one efficiency rationale for this widespread restriction on housing choice that only economists talk much about (Hamilton, 1976; Fischel, 2001). But this rationale assumes a local property tax—something we could change if we wanted—and it is arguably outweighed by a long list of inefficiencies and inequities commonly associated with large-lot zoning and its landscape cognate, urban sprawl (White, 1975; Levine, 2005; Rudel et al., 2011).

It is noteworthy that farmland preservation—especially if it contributes to increased urban density and contiguous development—is a potential solution for a range of efficiency and equity problems that have nothing to do with future food security. If concerns about the future availability of food create the political will for a more efficient, more compact city, then these concerns may prove to be a useful fiction.

So what have preservation programs been doing since the 1980s to slow the loss of farmland near metropolitan areas? According to figures compiled by AFT, state agencies and nonprofits have preserved more than 1 million of the nation's agricultural acres nationwide, with the Northeastern states and California understandably near the top of the list (AFT, 2014a). This figure amounts to less than 1% of the total agricultural U.S. land base. While that may sound miniscule, these mostly state-driven programs typically target prime soils lying in the path of rapid development.

There is certainly no guarantee that these programs solve the sprawl problem. Housing can continue to be built at low densities and can 'leapfrog' over the protected parcels. The achievement of local food and amenity objectives demanded by voters, on the other hand, is likely. Fortunately, the people who are most concerned about such objectives are the ones paying for preservation, aided by federal tax write-offs and a few modestly-scaled programs of the USDA.

The federal government could, if it wanted, pump more money into this proven system. Aside from the general problem of fiscal austerity, this would require greater consensus among federal lawmakers on the food security aspects of the problem. Alternatively, it would require greater bipartisan commitment to urban planning objectives at the federal level, through an agency like HUD. Neither appears likely any time soon. Meanwhile, the recent consolidation of the Farm and Ranch Lands Protection Program into a broader Agricultural Conservation Easement Program has injected some uncertainty into the process of obtaining federal grants for the purchase of easements on working farms having little or no environmental significance.

If the age of sprawl is over, however, then farmland preservation activists can turn their attention to the neglected subject of managing our half-preserved, half-developed exurban mosaic for maximum efficiency in the production of food, fiber, and amenities. This is likely to be easier than taking the long view on land to minimize downside risks. That is something that the political establishment finds difficult under the best of circumstances.

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