RESEARCH

Changes in land quality accompanying urbanization in U.S. fast-growth counties

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ABSTRACT: Changes in the quality of the cropland base due to urban growth in 135 1970s and 115 1980s fast-growth counties were investigated using paired-point aerial photography and the 1987 National Resources Inventory. Land quality was assessed using the USDA prime farmland definition, LCC I-III, and potential gross revenue per cropped acre. The empirical evidence did not support conventional wisdom regarding concentration and urbanization of better quality land in urbanizing areas. Evidence on net changes in cropland quality was mixed: quality declined using the prime land and LCC I-III measures, but potential gross revenue per acre increased.

During the 1970s, the public became concerned that the United States was losing large amounts of high quality farmland to urban development and voiced concerns about negative impacts of such losses on open space, watersheds, public infrastructure costs, rural lifestyles, and local agricultural self-sufficiency (*3,7*). Fears of substantial declines in food production from loss of these lands and an accompanying decrease in economic value to society and the farm sector also were raised. These concerns provided the impetus for adoption of various farmland protection programs, including preferential property tax assessment laws in all 50 States (*1,14*). While the negative local impacts of land use change may or may not be valid concerns justifying farmland protection programs, it is more difficult to argue that farmland lost to urban development is a significant constraint on national food and fiber production capacity (*12,6,2*).

Farmland loss is a small part of a larger mosaic of land use changes. Land shifts from one use to another in response to economic factors. As a consequence, forest, pasture, range and other rural land is converted to cropland to offset losses to urbanization, making net losses quite small. Farmland retention proponents respond that losses of high-quality farmland are important, despite the relatively small absolute amounts of farmland lost. They assert that urban development is and has been disproportionally attracted to the same level, well-drained land that is best for crop production. Land brought into agricultural production to replace that lost to development is presumed to be inferior to that lost, reducing the overall quality of the cropland base.

Discussions of the quality of farmland lost to development have focused on the physical and chemical properties of the land, rather than on its economic value for food and fiber production. Previous research has shown that physical and economic measures of land quality can yield different results (*11,5,16*). If loss of farmland's productive capacity is a concern, one of the best measures of the quality of land lost to urbanization is change in the amount of food and fiber that can be produced on net land available for production, subtracting production on land lost to urban uses and adding new production on land converted to cropland. This measure must be denominated in dollar terms to overcome differences in the units of production and the relative value to society of the crops grown.

This study supplements sparse empirical data on farmland loss and adds this economic dimension to data on physical measures of farmland quality. We test three hypotheses: first, that the best agricultural land is disproportionally located in areas experiencing the greatest urbanization; second, that the best agricultural cropland is disproportionately converted to urban uses; and third, that land converted to cropland from other rural uses is of poorer quality than cropland converted to urban uses. Previous research into these questions is briefly reviewed. We then describe our methods and present empirical evidence on changes in the quality of the agricultural land base in the most rapidly growing counties during 1970-80. National Resources Inventory (NRI) data for fast-growth counties in the 1980s are also presented. Finally, we discuss correspondences between measures of the "best" agricultural land and draw conclusions and implications for farmland retention programs.

Previous research

Far from being a new or recent issue, the question of changes in land quality from urbanization has been studied since at least the 1960s. Four studies analyzed urbanization and land quality at the national or regional level. In a 1968 study of farmland loss and abandonment in the eastern United States, Hart (*10*) constructed an acreage-weighted average land capability class (LCC) index for each of 200 randomly selected counties and compared it to the amount of cleared farmland in 1959 and the loss of cleared farmland between 1910 and 1959. He found no statistically significant relationship between LCC, 1910-59 farmland loss, and 1959 remaining farmland.

Dill and Otte (*8*) found that a higher proportion of land urbanized in 96

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Table 1. Urbanization of nonfederal land, fast-growth and cropland loss/gain counties, 1970-80

	Fast-growth counties	Cropland loss counties	Cropland gain counties
		Thousand hectares	
Urban use, 1970	2,522	376	166
Converted from:			
Agricultural uses *	346	61	22
Rangeland	214	26	11
Forestland	225	6	6
Other uses†	151	11	2
Gross increase in urban use	936	103	42
Converted to rural uses	20	4	0
Change in urban use	916	99	42
Coverage lacking/cloud cover‡	58	(4)	0
Urban use, 1980	3,497	471	208

* Includes cropland and pasture, orchards/groves/vineyards/ornamental horticulture/nurseries, and confined feeding operations or other agricultural areas.
† Includes water bodies less than 16 hectares, wetlands, barren land, and land in transition from one use to another.
‡ Net acreage of points for which one date could not be interpreted because photographic coverage was not available or was obscured by cloud or snow cover.
( ) Parentheses indicate a negative number.
Detail may not add to totals due to rounding.

Table 2. Change in nonfederal agricultural land, fast-growth and cropland loss/gain counties, 1970-80

	Fast-growth counties	Cropland loss counties	Cropland gain counties
		Thousand hectares	
Agricultural use, 1970 *	9,401	3,993	2,513
Converted from:			
Rangeland	286	30	153
Forestland	63	50	76
Other uses†	46	6	19
Gross increase in ag use	395	87	248
Converted to			
Urban	346	61	22
Rangeland	129	49	8
Forestland	48	8	2
Other uses†	93	26	9
Gross decrease in ag use	616	144	41
Gross change in ag use	(222)	(57)	208
Coverage lacking/cloud cover‡	109	53	4
Agricultural use, 1980 *	9,288	4,037	2,724

* Includes cropland and pasture, orchards/groves/vineyards/ornamental horticulture/nurseries, and confined feeding operations or other agricultural areas.
† Includes water bodies less than 16 hectares, wetlands, barren land, and land in transition from one use to another.
‡ Net acreage of points for which one date could not be interpreted because photographic coverage was not available or was obscured by cloud or snow cover.
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Northeastern counties between 1958 and 1967 was LCC I-III than the proportion of LCC I-III in the total land base. Vining, Plaut, and Bieri (*21*) used 1967 Conservation Needs Inventory data to determine that metropolitan and adjacent counties had higher proportions of LCC I-II land than the rest of the United States. However, they also calculated correlation coefficients between population change and the percentage of LCC I-II land, finding a negative correlation for both 1960-70 and 1970-74. A negative correlation indicates that counties with higher proportions of good land had lower population growth, contrary to the notion that urbanization is biased toward areas with better soil. This finding was further supported by Plaut's (*15*) regression analysis explaining 1959-69 farmland loss in 417 SMSA counties. A positive and significant regression coefficient was estimated for the percentage of LCC I-II land, indicating that less farmland loss occurs in counties with a higher proportion of better soils.

In addition to these comprehensive national or regional studies, there have been more detailed case studies for smaller areas. Berry (*4*) estimated farmland idled between 1930 and 1970 in the Philadelphia metropolitan area, classified as to the proportion of LCC I-II land. Correlation analysis of these data led Berry to conclude that "much of the idling of farmland may be due to retirement of poorer land" and that "only farmland situated close to the center of the region was idled largely because of urban pressures." Dillman and Cousins (*9*) matched soils and land use data for the Greenville-Spartanburg, South Carolina, metropolitan area. They found a significantly higher proportion of prime land was urbanized than was present in the area. Moon (*13*) studied farmland loss between 1950 and 1980 in Montgomery county, Alabama, finding a disproportionate loss of prime farmland relative to poorer quality land.

Canadian researchers have also been concerned with the quality of land lost to urbanization. In a study of land use changes between 1981 and 1986 in 70 urban-centered regions, 59% of all land converted to urban uses was prime (Canadian Land Inventory capability classes 1-3; 18). Conversion of Canadian prime agricultural land was greater than proportional in important agricultural areas such as Ontario, Manitoba, Quebec, and Saskatchewan. However, U.S. and Canadian situations are not directly comparable. Fifty-one percent of Canada's class 1 land is in the southwest corner of Ontario, the area containing Toronto. This would be analogous in the United States to having the population growth of Florida located in the heart of the Cornbelt.

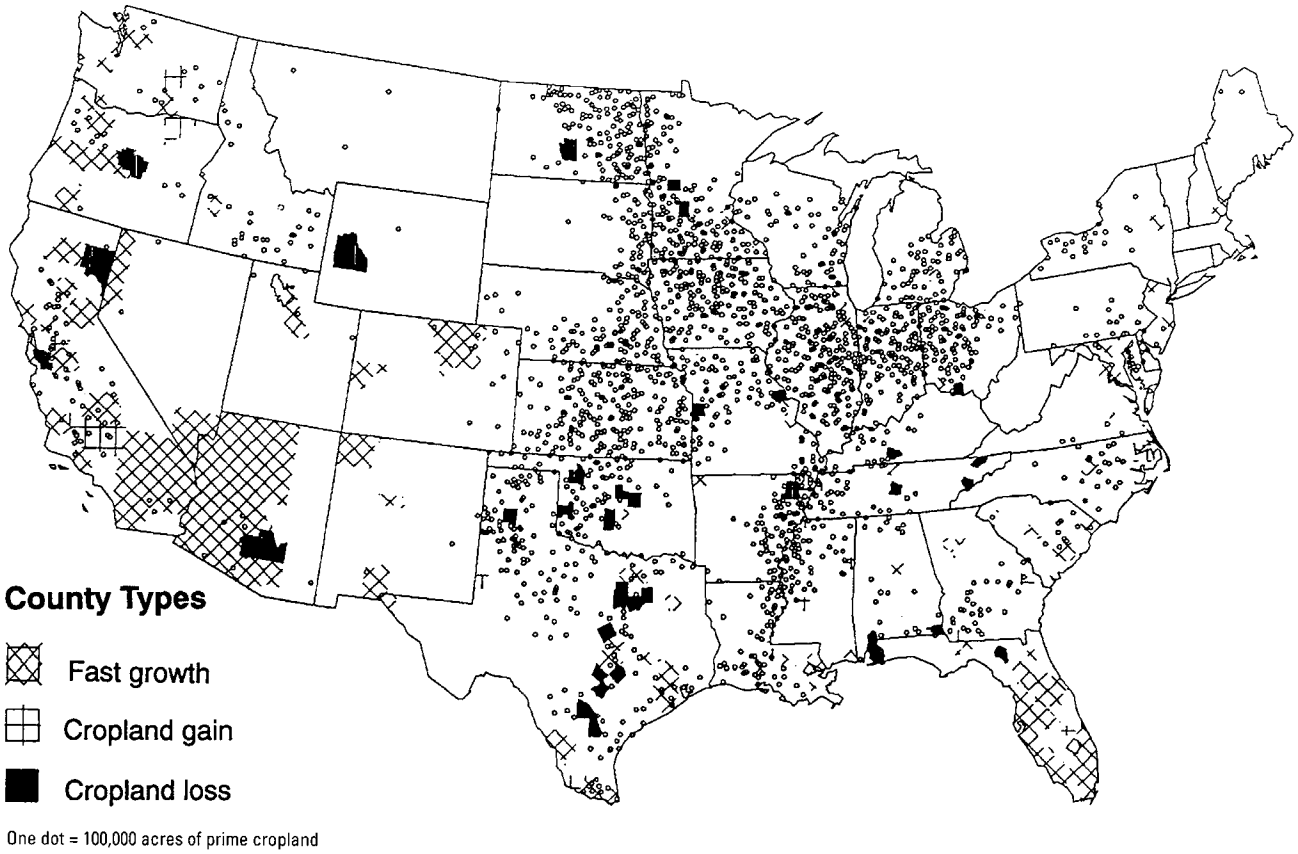

Figure 1. Prime cropland and fast growth counties

Data and methods

We use data from an Economic Research Service, USDA, study of land use change in 135 fast-growth counties defined as those that experienced absolute population growth of at least 25,000 persons and grew by at least 25% between 1970 and 1980 (*12*). Data from an additional 57 counties that grew less rapidly but experienced large changes in cropland were also included in the study (Figure 1). The sample consisted of 39,662 paired (early- and late-date) points selected using a stratified random spatial sampling design (*19,20*). Of these, 19,241 fell on nonfederal land in the fast-growth counties, 4,433 fell in cropland loss counties, and 2,745 fell in cropland gain counties, resulting in 26,419 sample points. Missing photo coverage, cloud or snow cover, and location outside defined land areas prevented interpretation of land use at one or both dates on 4,846 points, resulting in 21,573 points for which complete land use change information could be determined.

Land use and land use change were determined by interpreting early- and late-date aerial photography at each point. For each point at which the use was agricultural (cropland/pasture, orchards, groves, vineyards, nurseries or ornamental horticultural areas, or confined feeding or other farm buildings) at either date, a change in land use occurred, and a current soil survey map was available, the soil mapping unit was recorded. A total of 707 points met the first two criteria. For 153 of these points, current soil surveys were not available. Thus, the 554 remaining points constituted the data base for which land quality associated with land use change could be determined.

Measures of land quality

Based on the soil mapping unit at each of the subset of sample points, three measures of land quality were determined: USDA prime farmland, land capability class and subclass, and expected potential gross revenue from crop production. First, we determined whether the soil mapping unit met the USDA definition for prime farmland. In cases where the listings of USDA prime soils were conditioned on whether the area was drained or irrigated we reviewed the aerial photographs to make the final determination. Second, the land capability class and subclass of the soil mapping unit was recorded.

Prime farmland and LCC measures of land quality focus on characteristics of soils thought to be associated with high productive capacity. A more direct measure of productive capacity is potential to produce gross agricultural revenue. In such a measure, it is desirable to bring the various units of production for different crops to a common denominator and to reflect the social weighting of the importance of one crop over another. We did this by multiplying crop yield times crop price to obtain a common dollar metric: potential gross revenue from crop production. Potential irrigated and nonirrigated crop yields for up to 7 of the most common crops in the area were recorded from the soil interpretations record corresponding to the appropriate class-determining phase (slope, drainage, erodedness, etc.) of the soil mapping unit (*17*). In the case of forage crop yields listed in animal unit-months (AUMs) of grazing, average private market grazing fees per AUM were used as prices. Because neither the exact crop grown on each point nor the crop rotation was known, the simple average gross revenue per acre

Table 3. Land Use Change by USDA Prime Farmland Definition, fast-growth and cropland loss/gain counties, 1970-80

	Fast-growth counties	Cropland loss counties	Cropland gain counties‡
Agricultural land		Thousand hectares	
Converted to urban uses			
Prime	127	20	7
Not prime	178	27	2
Total	305	47	9
In transition to urban			
Prime	15	4	0
Not prime	34	4	0
Total	49	8	0
Converted to rural uses			
Prime	47	28	7
Not prime	116	31	6
Total	163	61*	13
Other rural land			
Converted to agricultural uses			
Prime	43	19	31
Not prime	254	53	121
Total	297	73	152
Net change in agricultural land			
Prime	(146)	(34)	17
Not prime	(74)	(8)	113
Total	(220)	(44)*	130
Agricultural land base, 1970 †			
Prime	4,191	1,776	1,166
Not prime	5,391	1,517	1,726
Total	9,582	3,335 *	2,891

* Includes 1 point (2,023 hectares) for which the prime farmland status could not be determined.
† Estimated from the 1982 NRI. Net losses of agricultural land that occurred between 1970 and the 1982 inventory date are added back to the 1982 NRI land estimates.
‡ Prime/not prime entries in this column are based on too few observations for statistical validity.
( ) Parentheses indicate a negative number.
Detail may not add to totals due to rounding.

over the maximum of 7 crops which could be listed was recorded for each of the 554 sample points.

Arguments about changes in land quality from urbanization are usually stated in relative terms; that the proportion of prime land converted to urban uses is greater than that of other land. We used the 1982 National Resources Inventory (NRI) to estimate the overall amounts of cropland, pastureland, and other land in farms that met the USDA prime farmland definition and LCC distribution in the study counties.

We also compared our data for the 1970s to NRI data on land use changes that occurred at NRI sample points inventoried in 1982 and 1987. Information on prime farmland and LCC characteristics of cropland and pasture converted to urban uses and other rural land converted to cropland and pasture is presented for the 115 counties that met our fast-growth definition in the period 1980-90.

Changes in urban and agricultural land uses

Almost 1 million hectares (2.3 million acres) of rural land were converted to urban uses in the fast-growth counties during the 1970s, of which 37% was agricultural land (Table 1). In this paper, we use the term "agricultural land" to refer to cropland and pastureland that can be used in intensive agricultural production. Urban uses increased 28% over the decade. In cropland loss and cropland gain counties, urban use increased only 25%, but more than half (52-59%) of the urbanized land was agricultural. In all cases, little land was converted from urban uses back to rural use. Net urbanization (gross increase less gross decrease) was less than the difference between urban use acreage in 1970 and 1980 because of points for which no photo coverage was available or could be interpreted at one or both dates due to cloud or snow cover.

Fast-growth counties experienced a net loss of only 222,000 hectares (548,000 acres) of agricultural land (2.3%), because much of the gross loss to urban and other uses was replaced by gross gains from other uses (Table 2). A total of 616,000 hectares (1.5 million acres) of agricultural land were converted to other uses, including the 346,000 hectares (854,000 acres) urbanized. However, 395,000 hectares (975,000 acres) were converted to agricultural land from other rural uses such as range and forestlands. Urbanization accounted for 56% of gross agricultural land losses and rangeland contributed 72% of land converted to agricultural use.

Cropland loss counties lost 57,000 hectares (141,000 acres; 1.4%) of agricultural land. This resulted from 144,000 hectares (355,000 acres) converted from agricultural use and 87,000 hectares (214,000 acres) converted to agricultural use. Urbanization accounted for 42% of gross agricultural land losses and forestland contributed 57% of agricultural land gained.

Cropland gain counties posted a net addition of 208,000 hectares (513,000 acres; 8.3%) of agricultural land, including gross gains of 248,000 hectares (614,000 acres) and gross losses of 41,000 hectares (102,000 acres). Urban uses took 53% of the land lost to agriculture, while rangeland contributed 62% of land converted to agricultural uses.

Changes in USDA prime agricultural land

According to the 1982 NRI data, smaller proportions of agricultural land and total land in the fast-growth counties meet the USDA prime farmland definition than for the United States. Only 44% of agricultural land in fast-growth counties is prime, compared to 49% in the United States as a whole. Twenty-four percent of all United States rural, nonfederal land is prime, but only 11% of land in the fast-growth counties meets the prime definition. Much of the land in rapidly urbanizing parts of Florida and California is not prime because the soils found there, although well-suited to certain kinds of highly productive specialty crop agriculture,

do not have the physical attributes required for prime land. In the urbanizing Southeast and Southwest, many soils are classified as conditionally prime (i.e., only prime if they are drained or irrigated). This means that the highest potential yields can only be obtained if drainage or irrigation is practiced.

Because soil mapping unit information could only be obtained on 554 of the 707 sample points which were in agricultural use in one of the two dates and changed use over the period, subsequent analyses shown in Tables 3-5 are for subsets of the acreages shown in Tables 1 and 2. Some 127,000 hectares (42%) of the agricultural land converted to urban uses in fast-growth counties was on soils that met the USDA prime farmland definition (Table 3). Only 31% of land in transition to urban uses at the time of the late date airphoto was prime. Adjusting the 1982 NRI estimates for losses of prime agricultural land indicates that 44% of the agricultural land base was prime at the beginning of the decade. Thus, prime agricultural land was converted to urban uses slightly less than proportionally to its occurrence. Of the 163,000 hectares (403,000 acres) of agricultural land converted to other rural uses, only 29% was prime. Fifteen percent of land converted from other rural uses to agriculture was prime. On net, 146,000 hectares (360,000 acres) of prime land left agricultural use during the 1970's. This was 3.5% of the prime agricultural land in fast-growth counties in 1970. Prime land converted to agricultural use offset 31% of that lost to urban uses and in transition. Based on USDA prime farmland criterion, the quality of cropland in fast-growth counties declined because the amount of prime agricultural land urbanized and in transition to urban uses exceeded the amount replaced from other rural uses.

Cropland loss counties had similar results. Of the agricultural land converted to urban uses, 43% was on soils that met the USDA prime farmland definition. This was a smaller proportion than the 53% of all agricultural land in cropland loss counties that was prime farmland. The quality of cropland in these counties also declined since the 19,000 hectares (48,000 acres) of prime land converted to agricultural use did not fully replace the acres converted to urban uses or in transition. The net loss of prime land was 1.9% of total prime land in these counties in 1970. Less than half of the prime land was lost to irreversible uses. Proportions for the cropland gain counties are not significant, because the number of sample points represented is too small to be meaningful.

Table 4. Land Use Change by Land Capability Class, fast-growth and cropland loss/gain counties, 1970-80

	Fast-growth counties	Cropland loss counties	Cropland gain counties‡
Agricultural land		Thousand hectares	
Converted to urban uses			
LCC I-III	166	36	7
LCC IV-VIII	133	11	2
Total	305 *	47	9
In transition to urban			
LCC I-III	27	8	0
LCC IV-VIII	21	0	0
Total	49	8	0
Converted to rural uses			
LCC I-III	103	47	4
LCC IV-VIII	60	12	8
Total	163	61 *	13
Other rural land			
Converted to agricultural uses			
LCC I-III	108	38	74
LCC IV-VIII	191	30	78
Total	297	73 *	152
Net change in agricultural land			
LCC I-III	(188)	(53)	62
LCC IV-VIII	(23)	7	68
Total	(220) *	(44) *	130
Agricultural land base, 1970 †			
LCC I-III	5,979	2,645	2,222
LCC IV-VIII	3,595	707	669
Total	9,582 *	3,335 *	2,891

* Includes points for which the land capability class could not be determined.
† Estimated from the 1982 NRI. Net losses of agricultural land that occurred between 1970 and the 1982 inventory date are added back to the 1982 NRI land estimates.
‡ LCC entries in this column are based on too few observations for statistical validity.
( ) Parentheses indicate a negative number.
Detail may not add to totals due to rounding.

Changes by land capability class

Based on the 1982 NRI, a smaller proportion of agricultural land in the fast-growth counties is in LCC I-III than for the United States. Only 62% of agricultural land in fast-growth counties is in LCC I-III, compared to 77% in the United States as a whole. Forty-three percent of all United States rural, nonfederal land is in LCC I-III, but only 39% of land in the fast-growth counties is in these better classes.

In fast-growth counties, 54% of the agricultural land converted to urban use and 56% of the land in transition to urban use was on soils with LCC I-III (table 4). This was less than proportional to the amount of agricultural soils that were LCC I-III at the beginning of the decade (62%). Of land converted from agriculture to other rural uses, 63% was in LCC I-III. Only 36% of rural land converted to agricultural uses was class I-III.

On a net basis, the quality of agricultural land measured by LCC declined. The 108,000 hectares (266,000 acres) of LCC I-III land converted to agriculture was less than the 193,000 hectares (476,000 acres) of LCC I-III land converted to urban uses and in transition. However, net losses of LCC I-III land amounted to only 3.1% of estimated amount of LCC I-III land in fast-growth counties in 1970.

In the case of cropland loss counties, urbanization of LCC I-III land was proportional to the amount of LCC I-III land present: 77%. While the percent-

age of better class land converted to agricultural use was higher (53%) than for fast-growth counties, it was still less than proportional to better class land in these counties. Cropland loss counties lost 2% of their original LCC I-III land, and 48% was converted to irreversible uses. Proportions for the cropland gain counties are not significant since the number of sample points represented is too small to be meaningful.

Changes in gross revenue potential

We examined the total change in revenue potential implied by changes in land use to and from agricultural use and the average revenue potential per acre of land changing uses (Table 5). We used the potential gross revenue measure described above. In aggregate, land in fast-growth counties with potential to produce $477 million in gross agricultural revenue was converted to urban uses and replaced by land capable of producing $557 million. In addition, land with $72 million in revenue potential was in transition to urban uses at the late date of photography. Land with $213 million in revenue potential was converted to other rural uses. On net, fast-growth counties lost $205 million in annual agricultural production capacity due to urbanization, but gained $8 million in capacity (557-477-72) if only irreversible uses are considered. This lost capacity was associated with a net loss of 220,000 hectares (543,000 acres), but only 57,000 hectares (140,000 acres) was lost to irreversible uses.

The average gross revenue potential of fast-growth county agricultural land urbanized was $1,693 per hectare ($686 per acre), while the average acre of other rural land (range, forest, and other) converted to crop and pasture production was $2,213 per hectare ($896 per acre). On net overall, an aggregate loss of $205 million in productive capacity on 220,000 fewer hectares (543,000 fewer acres) in production resulted in a net loss of $898 per hectare ($363 per acre) in average productive capacity. However, all of that loss was due to conversion to less intensive uses (range, forest, and other uses) of cropland. Looking just at losses to urbanization, average per acre revenue potential actually rose slightly ($141 per hectare; $57 per acre) despite a net loss of acreage. This is because land with higher average revenue potential was brought into production to replace lower productivity land lost to urban uses.

Table 5—Land Use Change by gross revenue potential, fast-growth and cropland loss/gain counties, 1970-80

Land use change and county type	Aggregate gross revenue potential	Acres			Average revenue per acre
		No yield *	With yield	Total	
Agricultural land	Million dollars	Thousand hectares			Dollars per hectare
Converted to urban uses					
Fast-growth counties	477	23	305	305	1,693
Cropland loss counties	18	2	47	47	401
Cropland gain counties	15	0	9	9	1,685
In transition to urban					
Fast-growth counties	72	2	49	49	1,561
Cropland loss counties	3	0	8	8	353
Cropland gain counties	0	0	0	0	0
Converted to rural uses					
Fast-growth counties	213	11	163	163	1,400
Cropland loss counties	29	6	61	61	527
Cropland gain counties	27	0	13	13	2,085
Other rural land					
Converted to agricultural uses					
Fast-growth counties	557	45	297	297	2,213
Cropland loss counties	41	8	73	73	633
Cropland gain counties	136	0	152	152	896
Net change in agricultural land					
Fast-growth counties	(205)	8	(228)	(220)	(898)
Cropland loss counties	(9)	0	(44)	(44)	(206)
Cropland gain counties	94	0	130	130	724

* Area of sample points where gross revenue potential could not be calculated because no potential yields were available from SOILS 5.
( ) Parentheses indicate a negative number. Detail may not add to totals due to rounding.

Changes in aggregate gross revenue potential in fast-growth counties involve land with potential to produce irrigated and nonirrigated crops, especially vegetables, fruits, and specialty crops. More than half of the land converted to urban uses (216,000 of 305,000 acres) and land converted from other rural uses to crop/pasture (183,000 of 297,000 acres) had irrigated crop production potential. Without irrigation water, these potentials cannot be realized, a situation that may be increasingly important in California, Florida, Colorado, and other fast-growth counties subject to competing urban demands for water.

In cropland loss counties, cropland and pasture with $401 in average revenue potential per hectare ($160 per acre) was lost to urbanization and replaced with land averaging $633 per hectare ($259 per acre). The change in aggregate productive capacity netted to nearly zero, with most losses attributable to less intensive uses of former cropland and pasture. In cropland gain counties, small losses of productive land averaging $1,656-$2,102 per hectare ($670-$851 per acre) to urban and other rural uses were offset by large gains of less productive land averaging only $899 per hectare ($364 per acre) in revenue potential. On net, aggregate revenue potential rose $94 million dollars because of a net increase of 130,000 hectares (321,000 acres) in agricultural use.

Results for the 1980s

Data from the 1987 NRI for fast-growth counties in the 1980's confirm our findings regarding urbanized land quality for the 1970s fast-growth counties. Only 40% of agricultural land in the most recent set of fast-growth counties is prime, compared to 49% in the United States as a whole. Twenty-four percent of all United States rural, nonfederal land is prime, but only 13% of land in the 1980-90 fast-growth counties meets the prime definition. Only 68% of agricultural land in these counties is in LCC I-III, compared to 77% in the United States as a whole. Forty-three percent of all United States rural, nonfederal land is in LCC I-III, but only 32% of land in the 1980-90 fast-

Table 6. Land Use Change by USDA Prime Farmland Definition and Land Capability Class, fast-growth counties, 1982-87

	Fast-growth counties	Percent
Agricultural land	Thousand hectares	
Converted to urban uses		
Prime	37	34.2
Not prime	70	65.8
Total	107	100.0
LCC I-III	76	71.0
LCC IV-VIII	31	29.0
Total	107	100.0
Other rural land		
Converted to agricultural uses		
Prime	16	14.6
Not prime	96	85.4
Total	112	100.0
LCC I-III	55	49.0
LCC IV-VIII	57	51.0
Total	112	100.0
Agricultural land base, 1982		
Prime	2,008	40.3
Not prime	2,971	59.7
Total	4,979	100.0
LCC I-III	3,398	68.2
LCC IV-VIII	1,581	31.8
Total	4,979	100.0

Source: 1987 National Resources Inventory.
Detail may not add to totals due to rounding.

growth counties is in these better classes.

Thirty-four percent (37,000 hectares; 91,000 acres) of the 107,000 hectares of agricultural land converted to urban uses in 1980-90 fast-growth counties was on soils that met the USDA prime farmland definition (table 6). Thus, prime agricultural land was converted to urban uses less than proportionally to its occurrence. Land converted from other rural uses to agriculture was only 14% prime. In 1980-90 fast-growth counties, 71% of agricultural land converted to urban use was on soils with LCC I-III. This was slightly more than proportional to the 68% of all agricultural soils in 1980-90 fast-growth counties that were LCC I-III at the beginning of the decade. Only 49% of rural land converted to agricultural uses was LCC I-III.

On net, 21,000 hectares (51,000 acres) of prime land was urbanized between 1982 and 1987, 1% of the prime agricultural land in 1980-90 fast-growth counties in 1982. Prime land converted to agricultural use offset 44% of that lost to urban uses. Net losses of LCC I-III land amounted to less than 1% of LCC I-III agricultural land in 1980-90 fast-growth counties in 1982.

Just as in the 1970-80 fast-growth counties during the 1970s, the quality of cropland in 1980-90 fast-growth counties declined in 1982-87 because the amount of prime agricultural land urbanized exceeded the amount replaced. The quality of agricultural land measured by LCC also declined since the 55,000 hectares (135,000 acres) of LCC I-III land converted to agriculture was less than the 76,000 hectares (188,000 acres) of LCC I-III land converted to urban uses. Estimates of the change in gross revenue potential of cropland caused by land use change in 1980-90 fast-growth counties are not available to compare with our results for the 1970-80 fast-growth counties.

Conclusions

We developed empirical evidence to test three hypotheses regarding the quality of land converted to urban uses in the fastest growing counties in the United States during the 1970s and the 1980s. The evidence shows that the best agricultural land is less than proportionally located in areas with the greatest population growth, which are the areas with the greatest urbanization. Smaller proportions (44 and 34 %) of agricultural land are prime in the 1970-80 and 1980-90 fast-growth counties than for the U.S. as a whole (49%). Only 62 and 68% of agricultural land in fast-growth counties is in LCC I-III, compared with 77% in the United States. Fast-growth counties had smaller proportions of prime and LCC I-III land in their total land base than for the U.S., as well.

Second, within fast-growth counties, the best cropland is not converted to urban uses more rapidly than other land. Urbanization occurs about equally on better and poorer quality land. Smaller proportions of prime agricultural land (42 and 34%) are converted to urban uses than the proportions of prime land occurring in fast-growth counties (43 and 40%). LCC I-III agricultural land converted to urban uses (54%) is less than proportional to its existence (62%) in fast-growth counties of the 1970's and is slightly more than proportional in the 1980-90 fast-growth counties.

Results regarding the quality of land converted for cropland use to replace that lost to urbanization are mixed. Prime land in other rural uses is converted for agricultural use, replacing 31 and 44% of that lost to urban uses in fast-growth counties of each decade. Other LCC I-III rural land converted to agricultural use replaces 56 and 72% of that lost to urban uses in fast-growth counties in each decade. Using either the prime farmland and LCC measures, the quality of the cropland base in fast-growth counties declines.

However, by the most direct measure of land's value in agricultural production, the quality of the cropland base increases under the impact of urbanization. Gains of land averaging $2,213 ($896 per acre) in revenue potential per hectare exceed losses of land averaging $1,693 per hectare ($686 per acre) to urbanization in 1970-80 fast-growth counties. All of the net loss in productive capacity is due to less intensive use of former crop and pasture land, which can be reversed in the future if necessary.

Focusing on fast-growth areas keeps the relatively small impact of urban growth on agricultural productive capacity in perspective. Fast-growth counties had 47 and 49% of the total U.S. population increase during the 1970's and 1980's and most of the land use change associated with urbanization. However, the net loss of 220,000

hectares (543,000 acres) of cropland in the 1970's fast-growth counties amounts to only 2.3% of fast-growth county cropland and less than 0.2% of the 132 million hectares (326 million acres) of U.S. cropland harvested. Net loss of prime cropland is 3.5% of fast-growth county prime cropland, and only 0.2% of U.S. prime cropland. The net loss of LCC I-III cropland is a similarly small proportion of fast-growth county and U.S. LCC I-III land. Net loss of $100 to $134 million in gross revenue potential in 1970-80 fast-growth counties is less than 0.01% of total U.S. sales of agricultural products in 1982.

These findings have implications for farmland conservation policy. Urban development does not appear to discriminate regarding the quality of land for agricultural production. Better quality land was converted at most in proportion to its existence in fast-growth areas. This suggests that attempts to focus development on less productive land could be successful. However, if concern about farmland loss is focused less on agricultural production than other problems, less attention should be paid to the productive quality of the land lost. Concerns about open space impacts, watersheds, public infrastructure costs, rural lifestyles, and local agricultural self-sufficiency, might be better addressed by conserving lower quality land that solves these problems than by a single-minded focus on prime or LCC I-III land. Of all reasons for concern about the quality of land lost to urban development, its impact on aggregate U.S. productive capacity appears to be the least well founded empirically.

REFERENCES CITED

1. Aiken, J.D. 1989. *State Farmland Preferential Assessment Statutes.* RB-310. Agricultural Research Division, University of Nebraska, Lincoln, NE.
2. Anderson, W.D., G.C. Gustafson, and R.F. Boxley. 1975. *Perspectives on agricultural land policy.* Journal of Soil and Water Conservation, 30(1):36-43.
3. Barrows, R., and E. Troutt. 1989. *National concerns over urbanization of rural land.* In R. Heimlich (ed.) *Land Use Transition in Urbanizing Areas: Research and Information Needs.* Proceedings of a Workshop. USDA-ERS and the Farm Foundation, Washington, DC. pp. 1-14.
4. Berry, D. 1978. *Effects of urbanization on agricultural activities.* Growth and Change, 9(3):2-8.
5. Bills, N.L., R.E. Heimlich, and S. Stachowski. 1984. *Crop Yields and Net Income on Prime Farmland in New York.* A.E. Res. 84-21. Department of Agricultural Economics, Cornell University, Ithaca, New York.
6. Brewer, M.F., and R.F. Boxley. 1981. *Agricultural land: Adequacy of acres, concepts and information.* American Journal of Agricultural Economics, 63(5):879-887.
7. Bushwick, N. 1989. *State and local concerns: Information needs and actions for protecting agricultural land.* In R. Heimlich (ed.) *Land Use Transition in Urbanizing Areas: Research and Information Needs.* Proceedings of a Workshop. USDA-ERS and the Farm Foundation, Washington, DC. pp. 15-28.
8. Dill, H.W., Jr., and R.C. Otte. 1971. *Urbanization of land in the Northeastern United States.* ERS-485. Economic Research Service, USDA. Washington, DC.
9. Dillman, B.L., and C.F. Cousins. 1982. *Urban encroachment on prime agricultural land: A case study.* International Regional Science Review 7(3):285-292.
10. Hart, J.F. 1968. *Loss and abandonment of cleared farm land in the eastern United States.* Annals of the Association of American Geographers, 58(3):417-440.
11. Heimlich, R.E. 1989. *Productivity of highly erodible cropland.* Journal of Agricultural Economics Research 41(3):17-22.
12. Heimlich, R.E., M.C. Vesterby, and K.S. Krupa. 1991. *Urbanizing Farmland: Dynamics of Land Use Change in Fast-Growth Areas.* AIB-629. Economic Research Service, USDA. Washington, DC.
13. Moon, H.E., Jr. 1984. *The Loss of Farmland: The Process of Urbanization in Alabama's Black Belt.* Univ. of Alabama (Master's Thesis), Tuscaloosa, AL.
14. Peters, J.E. 1990. *Saving farmland: How well have we done?* Planning 56(9):22-25.
15. Plaut, T. 1976. *The Effects of Urbanization on the Loss of Farmland at the Rural-Urban Fringe: A National and Regional Perspective.* Regional Science Research Institute Discussion Paper No. 94. Philadelphia, PA.
16. Reganold, J.P., and M.J. Singer. 1984. *Comparison of farm production input/output ratios to two land classification systems.* Journal of Soil and Water Conservation 39(1):47-53.
17. U.S. Department of Agriculture, Soil Conservation Service. 1983. *Application of Soil Information: Soil Interpretations.* Part 603. National Soils Handbook. Washington, DC.
18. Warren, C.L., A. Kerr, and A.M. Turner. 1989. *Urbanization of Rural Land in Canada, 1981-86.* SOE Fact Sheet No. 89-1, Environment Canada. 12 pp.
19. Vesterby, M.C. 1988. *Land use change in fast-growth counties: Analysis of study methods.* Staff Report AGES880510. Economic Research Service, USDA. Washington, DC.
20. Vesterby, M.C., and R.E. Heimlich. 1991. *Land use and demographic change: Results from fast-growth counties.* Land Economics, 67(3):279-291.
21. Vining, D.R., Jr., T. Plaut, and K. Bieri. 1977. *Urban encroachment on prime agricultural land in the United States.* International Regional Science Review, 2(2):143-156.