Economic Situation and Prospects for Maryland Agriculture

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EXECUTIVE SUMMARY

Situation and Trends

Maryland's farm numbers and land in farms are declining, and in the most suburbanized counties commercial agriculture is particularly at risk. Even in the more rural parts of the state the prospect of continuing conversion of farmland to nonagricultural uses has raised concerns about the future. These concerns are amplified by increased regulation of farming and potentially eroding support for policies needed to keep agriculture commercially viable. The costs of farming in this situation, along with the historically weak markets for the major crop and livestock products, raise the issue of the economic sustainability of commercial agriculture in Maryland. But at the same time there are a number of positive elements and opportunities that help counter these concerns.

A summary of the main negative and positive elements of the situation are as follows:

Indicators of problems:

- Many farms have gone out of business in recent years, especially notable in hog and dairy production. Acreage of some commodities, notably vegetables for processing, has declined substantially, and tobacco is on the verge of disappearance.

- The age of farm operators has been rising for two decades, and the average Maryland farm operator is now over 54 years old – indicating the importance of a flow of new replacement farmers.

- Small-scale and part-time farming is increasing as a fraction of the state's farms, and the majority of these operations have expenses greater than receipts. This suggests an eroding base for commercially viable agriculture in the state as a whole.

- Farmland continues to be lost to suburban development at a rate that threatens the maintenance of a critical mass of agricultural activity in some areas of the state.

- Public perception of farming appears to have shifted toward seeing agriculture as a threat to water quality and other environmental values, and this is reflected in policies that are imposing increasing regulatory burdens on farmers.[1]

Positive indicators:

- Farming remains a viable way of life for thousands of people, and agriculture remains a major factor in Maryland's economy, the single biggest factor in the economy of

[1] Most notably, agricultural activity has been associated with nitrogen and phosphorus runoff that is held responsible for declines in water quality in the Chesapeake Bay and its tributaries.

many areas of the state.[2] And, since 1990 the rates of loss of farm numbers and farmland have moderated from the losses of earlier decades.

- The incomes of farm operator households in Maryland are on average favorable as compared to other states.[3] For small and part-time farms, this is a consequence of off-farm income sources. For larger commercial farms, income from farming keeps the average operation economically viable. Commercial agriculture in Maryland, in comparison with neighboring states or the United States as a whole, is actually doing quite well in the face of difficult market conditions, by maintaining productivity growth, controlling costs, and by initiating shifts to market opportunities that have been relatively favorable compared to the traditional bulk farm commodities.

- For both small and large operations, the relatively high value of farmland owned is a source of asset value, despite the barriers posed for those who wish to enter farming or add to their land ownership. Maryland farms have lower debt/asset ratios than are typical in other states, and the net worth of the average farm at the beginning of 2000 was $501,000 in Maryland as compared to $429,000 for the U.S. as a whole, despite the smaller average size of Maryland's farms.

- At both state and federal levels, policies have recently been enacted, and amplified in the 2002 farm bill, that are aimed at preserving land in farming, assisting farmers in environmental stewardship, and providing support for commodity producers to offset currently low prices.

Future Prospects

Above and beyond statistics indicating declining economic health of Maryland and U.S. agriculture in recent years, many farmers and others closely connected with agriculture have expressed a lack of confidence that current national, state, and local policies are adequate to address agriculture's problems. Our meetings with stakeholder groups and individuals indicate two basic sources of such worries. The first is that the already fragile economic viability of many Maryland farm operations will be subject to further economic stress from low returns and rising costs. The second, a broader concern that leads to pessimism about whether the necessary steps will be taken to keep people involved with and investing in agriculture, is that agriculture is underappreciated by the nonfarm population, including the predominant tenor of local and state government.

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[2] The farming sector and its related industries (e.g., agricultural inputs and services and food processing) accounted for about $5 billion (3 percent) of the Maryland gross state product in 1999 and employed 62,700 people (12,400 farm operators, 5,900 farm laborers, and 44,300 in farm input and service supply and agricultural processing). These contributions are not declining over time, even though the share of the state's economic activity accounted for by agriculture is declining in Maryland as in other states because non-agricultural sectors are growing faster.

[3] In 2000, Maryland's average net income per farm, estimated at $33,000 by USDA's Economic Research Service, was well above not only Pennsylvania and Virginia, but exceeded the US average substantially and was even well ahead of Iowa's $27,000 despite the larger average farm size there. Moreover, Maryland's relative economic success was not just a matter of 2000 being exceptional. Since 1980 the trend rate of growth of net income per farm has been higher in Maryland than in neighboring states and the U.S. as a whole.

Further risks arise from the possibility that the declines in farms and farm acreage may, over the next 20 years, go so far as to seriously impair the economic health of nonmetropolitan areas of the state. For example, if the grain-broiler economy of the Shore begins to decline, might that generate an accelerating downward economic cycle as the land or production base falls below some critical level needed to sustain the industry at an efficient scale?

And, even if the nonfarm population's view of agriculture is more positive than pessimistic views suppose, that is not sufficient to guarantee policies that will translate to an improved economic situation for traditional, commercially based agriculture. The nonfarm public may be equally happy to see 300 acres devoted to several small recreational horse farms as to a working dairy farm; but many in agriculture would see the conversion from the latter to the former as a substantial social and economic loss. Similarly, increased uses of land for environmental protection purposes is what the public desires, but in many instances land is thereby removed from traditional commercial crop use and hence squeezes commercial agriculture further. Particular problems arise for crop producers who must rent land beyond the acreage they own in order to attain an economically viable scale of operation.

In order to project the likely future evolution of Maryland agriculture, in terms of farm numbers, land in farms, and value added to the state's economy, it is important to understand the reasons underlying recent trends. The reasons are economic. That is, land disappears from farming, and farm operators leave agriculture and are not replaced by a new generation of farmers because the economic rewards from farming are less than the rewards from alternative nonagricultural uses of people's land and labor. The question is then, what forces lie behind the decreased economic opportunities in farming as compared to nonagricultural pursuits? Explanatory factors that surfaced in our interviews and reviews of studies carried out on the agricultural economy of other states and the U.S. as a whole are:

- weak markets for traditional commodities, causing declining prices
- limitations and constraints on alternative marketing opportunities
- development pressures causing land conversion to nonfarm uses
- environmental regulations and programs
- labor constraints
- other costs hindering Maryland's competitive advantage

Each of these factors are discussed in detail in the body of the report that follows.

A complication is that Maryland's farms are very heterogeneous, not only with respect to size of operation and other individual characteristics of farm enterprises, but also in facing very different problems in different regions of the state. For purposes of our analysis, three geographic regions are distinguished, based on degree of urbanization of counties (using U.S. Department of Commerce criteria for metro areas):

- *Central metropolitan counties* have the largest populations and are found along the Baltimore-Washington, DC axis (Anne Arundel, Baltimore, Howard, Montgomery, and Prince George's);

- *Other metropolitan counties* located a greater distance from the Baltimore-Washington, DC axis (Allegany, Calvert, Carroll, Cecil, Charles, Frederick, Harford, Queen Anne's, and Washington);

- *Non-metropolitan counties* located on the Eastern Shore and southern and western Maryland (Caroline, Dorchester, Garrett, Kent, St. Mary's, Somerset, Talbot, Wicomico, and Worcester).

Overall, farms in the large metropolitan counties collectively produce only 10 percent of Maryland's farm output (measured in terms of market value), while farms in the other metropolitan and non-metropolitan areas contribute about 32 percent and 58 percent, respectively. While the majority of farms are small in all regions,[4] the share of all farms is higher in the two metropolitan regions (89 percent in large metro; and 80 percent in other metro) compared with the non-metropolitan region (62 percent). Residential-lifestyle farms (operators relying mainly on an off-farm occupation) and retirement farms[5] predominate within the metropolitan counties. The large number of small, retired, and residential farms in the metropolitan areas indicates a different type of agriculture than the traditional commercial farms.

Many differences in trends between Maryland and the U.S. as a whole are largely a matter of Maryland being a highly urbanized state, but the difference is not a matter of the rate of overall population growth crowding out farming. Maryland's population is growing at almost exactly the rate of the U.S. as a whole, faster than Pennsylvania's and slower than Virginia's. The loss of farmland is more specifically tied to the diffusion of residences and associated businesses through the formerly rural areas of metro-area counties, i.e., suburban sprawl. Since 1980 the annual rate of decline of land in farms in the central metro counties has been 2.1 percent, while in the rest of the state the rate of decline is less than 1 percent annually.

Stakeholders interviewed for this report, even on the nonmetropolitan Eastern Shore, almost uniformly saw suburban sprawl as the number 1 or 2 threat to the future of Maryland agriculture. This reflects the fact that only in Talbot and Worcester counties has the rate of decline of land in farms since 1980 been as slow as the 0.5 percent rate of the U.S. as a whole. Moreover, the prevailing concern is not just because of the extent of land converted to date, but also because the nonfarm residents who move into farming areas too often tend to be inhospitable to the necessities of commercial agriculture. Moreover, as farms become separated by developments and their numbers within any given area decrease, product marketing and farm service supply become more difficult and costly. Yet the rate of loss of farms and farmland in the state as a whole has so far proceeded at a sufficiently slow rate that the tide may still be stemmed before irreparable economic damage is done.

Policy Considerations

In view of the overall success with which Maryland's farmers have confronted the many economic threats that have appeared over the last two decades, and the evidence that producers

[4] In this report we define small farms as those with sales of less than $100,000 annually.
[5] These terms are used as defined by the Economic Research Service of USDA.

are already adapting to the changing market and policy-driven demands placed upon them, our baseline projection for the next decade is for continued decline, but only at a relatively slow and manageable rate.[6] We expect further loss of about 40,000 acres of farmland and 200 to 400 farms by 2010. We do not expect an economic crunch that would cause a general wipeout of remaining farms, or that would cause severe economic hardship or losses for the farms that remain. But the future of agriculture is at risk in Maryland because of uncertainties surrounding many of the factors we have been discussing. In part, events will depend upon climatic and market forces which no one can predict or control for a decade-long future. Most importantly, what happens will also depend on local, state, and national policies that impact agriculture.

An issue that affects every region of the state is agriculture's effect on the environment, and environmental regulations in place or on the horizon that raise costs and reduce the competitiveness of Maryland farms. Local, state, and federal policies have embodied the view that agriculture's large land base and intensive, high-yield crop production, as well as regional concentration of animal production, pose risks of significant negative effects on water and air quality. The nutrient management requirements created by the Maryland Water Quality Improvement Act of 1998 (WQIA) are expected to affect both animal operations and crop growers. However, neither data nor reports of stakeholder groups provided evidence of significant effects that would hasten the decline of Maryland agriculture.

A problem created by the regulatory situation, which goes beyond environmental problems to labor management issues (such as provision of housing and other facilities needed to meet state and federal standards) and permits needed to undertake many improvements such as irrigation or drainage projects, is a perception that the state is decreasingly friendly to agriculture and farmers. This encourages retirements and other exits from farming, and discourages new entrants. It creates a climate that furthers the current tendency to depreciate the capital stock in agriculture and to avoid new investment. To remain economically viable in the future, substantial investment is essential on Maryland farms to make the commodity and market-niche adjustments necessary to stay on the frontier of new production technology and marketing opportunities.

A number of specific policies will be important but it is necessary first to confront a general division of opinion that prevails among those whom we consulted in preparing this report. One general view is that the best focal point for state-level and perhaps even national policy is a set of land preservation and conservation programs. Policies in these areas offer the most promise for maintaining land in farms while gaining support of the nonfarm population by promoting environmental goals and maintaining the scenic vistas that make rural Maryland so outstandingly attractive to all who dwell or visit. A counter-view is that these programs will accomplish little or nothing in the way of preserving agriculture as a commercial activity supporting traditional family farms. For that, what must be attained are economic conditions that enable returns to farming that will attract new entrants to farming, induce new investment, and encourage established farmers not to abandon their existing operations. The purest statement of this position is that if farming were made economically viable, farmland preservation programs would be unnecessary even in the central metro counties.

[6] By "baseline," is meant commodity markets rebounding modestly from the current lows as USDA's long-term commodity price baselines project, and commodity and regulatory policies that essentially continue what has been in place since 1996, as reinforced by the 2002 farm legislation enacted in May 2002.

This bifurcation of views reflects the fact that urbanization is a two-edged sword for farmers. On the one hand, urbanization impinges upon farmers, making the farming enterprise more costly and difficult. Development pressures raise the price of land; reducing the economic return to farming and increasing the potential gains by switching land to nonfarm uses. On the other hand, higher land values can provide security for loans or funds for retirement. Residential expansion has also created conflict between farm operations and residential amenities in many communities. At the same time, urbanization provides opportunities for agricultural enterprises to take advantage of nearby urban markets by altering their marketing and/or changing product mixes. Prospects for off-farm employment also increase with urbanization.

A policy issue that arises with respect to improving the economic viability of farming is the extent to which that end can be promoted through nationwide commodity programs. Currently, Maryland farmers receive commodity program payments that amount to about 20 percent of net farm income, focused on about half of Maryland's producers. In order to appreciably improve the economic viability of Maryland producers significantly enough to keep their land in farming, it would take at least a doubling or tripling of current outlays, and even that would not be enough to make agricultural use of land in the central metro counties competitive with development alternatives. Some in the 2002 farm bill debate argued that a shift of emphasis to spending several billion dollars on conservation/environmental programs would serve Maryland and other Eastern farmers better than current commodity programs. A problem however is that farmers' receipts of such funds would be tied to costly new undertakings by farmers, while current programs pay them for doing just what they are already doing anyway. On the other hand, the nonfarm population sees more of a benefit from the conservation/environment approach and is therefore more likely so support the necessary government spending over the long term.

Nonetheless, it remains the case that the net gain to farmers per dollar spent on farm programs is substantially larger for current commodity programs than would be the case for conservation/environmental programs. Moreover, the hard truth is that Maryland farmers have shared as little in conservation program dollars as in commodity program dollars. In 2000, for example, Maryland accounted for 0.8 percent of the nation's agricultural output but received only 0.3 percent of FAIR Act (production flexibility contract and loan deficiency) payments, and received only 0.2 percent of Conservation Reserve Program payments. The relatively large role of non-program commodities in Maryland means that our state is relatively disadvantaged in federal programs.

Budget studies as well as recent trends indicate that our most promising future lies with non-program crops, including niche activities that embody substantial services beyond those of just growing the crops. However, it is important to recognize that all specialty crops, vegetables, orchards, and nursery/greenhouse crops together utilize only about 75,000 acres, while grains and soybeans occupy about 1.2 million acres. Thus, no conceivable expansion of the former set of commodities can serve to keep Maryland's current cropland in agriculture. The traditionally grown grain and soybean crops will remain crucial. This basic agriculture, centered on the Eastern Shore, has grown symbiotically with the broiler industry and each is necessary to the other. Maryland's grain growers are arguably placed in a better long-term economic position by the substantial premiums over Corn Belt grain prices that the demand for chicken feed creates

than by any conceivable price support program. So state-level policies that can promote the continued viability of broiler production in Maryland are arguably the most important agricultural policies the state can implement.

For all the preceding reasons it is not realistic to look to national level policies to improve the long-term outlook for Maryland agriculture. What can the state government reasonably do? The general thrust that appears most promising is to undertake public investments and foster private investments that will advance the state's comparative advantages and create new ones. Every state – including Maryland – across the country supports value-added agriculture in some fashion. The programs offered relate to the types of agriculture in each state, with state-grown product promotion and labeling programs being the most popular.

Agricultural marketing assistance could be used to more effectively exploit alternative marketing channels. Export promotion has been utilized by many state agricultural departments, but this approach is relatively dubious for Maryland, apart from broilers, because Maryland is typically a grain importing area. Maryland has been effective in facilitating the development of farmers' markets. But further issues could be explored specifically related to the barriers of increased participation in direct marketing and value-added agricultural activities. For instance, small scale farmers and food processors need assistance in complying with the panoply of food safety, labor, and environmental regulations at the federal, state, and local levels.

Maryland has been a national leader in enacting farmland preservation programs including conservation easements, purchase of agricultural easement programs, right-to-farm law, and differential assessments. At the local level, Maryland jurisdictions have enacted programs centered on comprehensive planning, right-to-farm ordinances, and transfer of development rights programs. Given the overarching goal of ensuring the survival of the agricultural economy by preserving productive farmland, specific goals for these programs have included: maximizing the number of preserved acres; preserving productive farms; preserving farms most threatened by development; and preserving large blocks of land. While our research indicates that these programs have had some significant effects, much could still be done to improve participation in state and local agricultural land preservation programs and to provide a more effective use of existing resources available to purchase agricultural land easements.

Another issue in farmland preservation is creating a stronger linkage among the various farmland protection, natural resource, and agricultural economic development programs in areas where the future of farmland is threatened. Some counties – in particular, those with established offices of agricultural economic development – are well on their way towards fostering such a linkage. The benefits relative to the costs of these policies remain to be established.

Farm labor supply needs are persistent to farm employers and complicated by the unpredictable nature of agricultural production. Currently, foreign workers can be employed temporarily in agriculture under the H-2A provisions of the Immigration and Nationality Act. However, there are a number of limiting factors – cumbersome lead time for employers, lack of certified housing, administrative pressures – that could be corrected by increased funding and Federal legislative changes. A state program to assist with development of worker housing may

facilitate the use of this program. The state could also usefully provide broader services to farmers in assisting them through the labyrinth of employer requirements and regulations.

In summary, there are many areas in which state as well as federal policy could assist in promoting a prosperous agriculture that contributes to Maryland's future economic vigor and quality of life. It is noteworthy that the most promising policies are not huge departures from current directions, but rather intensification of what is working and pulling back from what is not. If Maryland's agricultural economy and policies were to continue on their current path, our projections suggest that that the rapid rates of loss of farm and forest resources of past decades will not return over the next ten to twenty years, although some segments of agriculture are at risk. Further losses of farmland will occur, as is inevitable as population continues to grow and affluence expands with its attendant demands for more living space for the average household. But these losses will continue to be manageable, at least for the immediate future.

ECONOMIC SITUATION AND PROSPECTS FOR MARYLAND AGRICULTURE

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INTRODUCTION

The future of agriculture in Maryland is clouded by a number of factors, many of them associated with the location of much of the state in a zone of rapid suburban development and with the emergence of environmental issues involving water quality in the Chesapeake Bay watershed. Some trends of recent years are concrete sources of concern. Maryland's farm numbers and land in farms have been declining throughout the post-World War II period. The age of farm operators has been rising for two decades, and the average Maryland farm operator is now over 54 years old – indicating that a continuing flow of new replacement farmers will be needed to prevent an acceleration of declining numbers. Commercial agriculture has been hit hard for many commodities – notably a big decline in processing vegetables in earlier decades and more recently tobacco; and smaller-scale dairy farming is in difficult circumstances.[7] In the suburban counties of the Baltimore-Washington corridor, it is questionable whether commercial agricultural production of traditional commodities will have a significant future.

Yet in most areas of the state, and for many commodities, Maryland agriculture continues to be competitive with other parts of the country, and farming remains a viable way of life for thousands of people. Agriculture remains a major factor in Maryland's economy, the single biggest factor in the economy of some areas of the state. A question that has to be faced by all concerned with the future of Maryland, in terms of both economic prosperity and quality of life, is whether agriculture's large and varied contributions to Maryland's economy and environment can be sustained. And, what can be done to help ensure the future economic health of the sector?

Above and beyond statistics indicating risks to the economic health of Maryland agriculture in recent years, many farmers and others closely connected with agriculture have expressed concern about the future and a lack of confidence that current national, state, and local policies are adequate to address current problems. Our meetings with stakeholder groups and individuals indicate two basic sources of such worries. The first is that the already fragile economic viability of many Maryland farm operations will be subject to further economic stress from low returns and rising costs. The second, a broader concern that leads to pessimism about whether the necessary steps will be taken to keep people involved with and investing in agriculture, is that agriculture is underappreciated by the nonfarm population, including the predominant tenor of local and state government.

This report addresses the issues in three sections: first, a review of the facts about the current situation and trends in Maryland agriculture, placed in the context of developments over time and in comparison to U.S. agriculture as a whole; second, explanation of these facts and trends, and implications for a baseline projection of the future of Maryland agriculture; and third, discussion of policy issues and alternatives for promoting agriculture and helping farmers cope with economic pressures and burdens that threaten the future economic viability of the sector.

[7] More than three-fifths of Maryland's tobacco farmers agreed to stop growing tobacco in return for state payments in 2000/2001; by 2002 more than 80 percent of the tobacco crop is expected to be gone.

SITUATION AND TRENDS

Land in Farms

Maryland has 2.15 million acres of farmland, over one-third of the state's land area. Fifty years ago, over half of the state's land area was used for farming. Maryland's trend toward a greatly reduced land share in agriculture is similar to that of other states in the Mid-Atlantic region, all of which are seeing farming decline substantially faster than in the United States as a whole. Table 1 shows annual percentage changes in land in farms for 1959-1997, separated into two sub-periods: the most recent decade covered by Census data (1987-87), and the preceding three decades. The rate of decline is slower everywhere in the latest ten-year period than it was earlier. But Maryland lost farmland at rate faster than neighboring states in 1987-97, which was not generally the case in earlier decades.

Maryland now ranks fifth among all states in percentage of land that is developed. An estimated 1.24 million acres of Maryland's land area are defined by the Natural Resources Conservation Service (NRCS) of the U.S. Department of Agriculture (USDA) as "developed" for purposes of residential, industrial, and commercial use, amounting to 16 percent of the state's area. About four times this much land area remains rural (Figure 1).

Nearly three-fourths of Maryland's agricultural land is cropland, with the remainder divided between pastureland, woodland, and other (e.g., houses and barns, lots, ponds, roads, and wasteland). Compared to neighboring states, except Delaware, Maryland has a higher share of farmland in crops (Figure 2).

Table 1. Annual Percentage Change in Land in Farms

	1959-1987	1987-97
Maryland	-1.31%	-1.06%
Delaware	-0.81%	-0.48%
New Jersey	-1.55%	-0.72%
New York	-1.68%	-1.49%
Pennsylvania	-1.47%	-0.93%
Virginia	-1.48%	-0.53%
U.S.	-0.51%	-0.49%

Source: U.S. Census of Agriculture

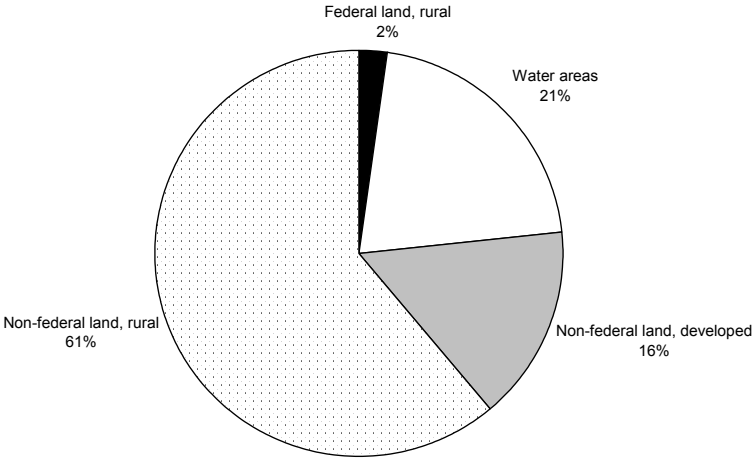

Figure 1. Land Use in Maryland, 1997
Source: USDA, Natural Resources Conservation Service. *Natural Resources Inventory, 2000.*

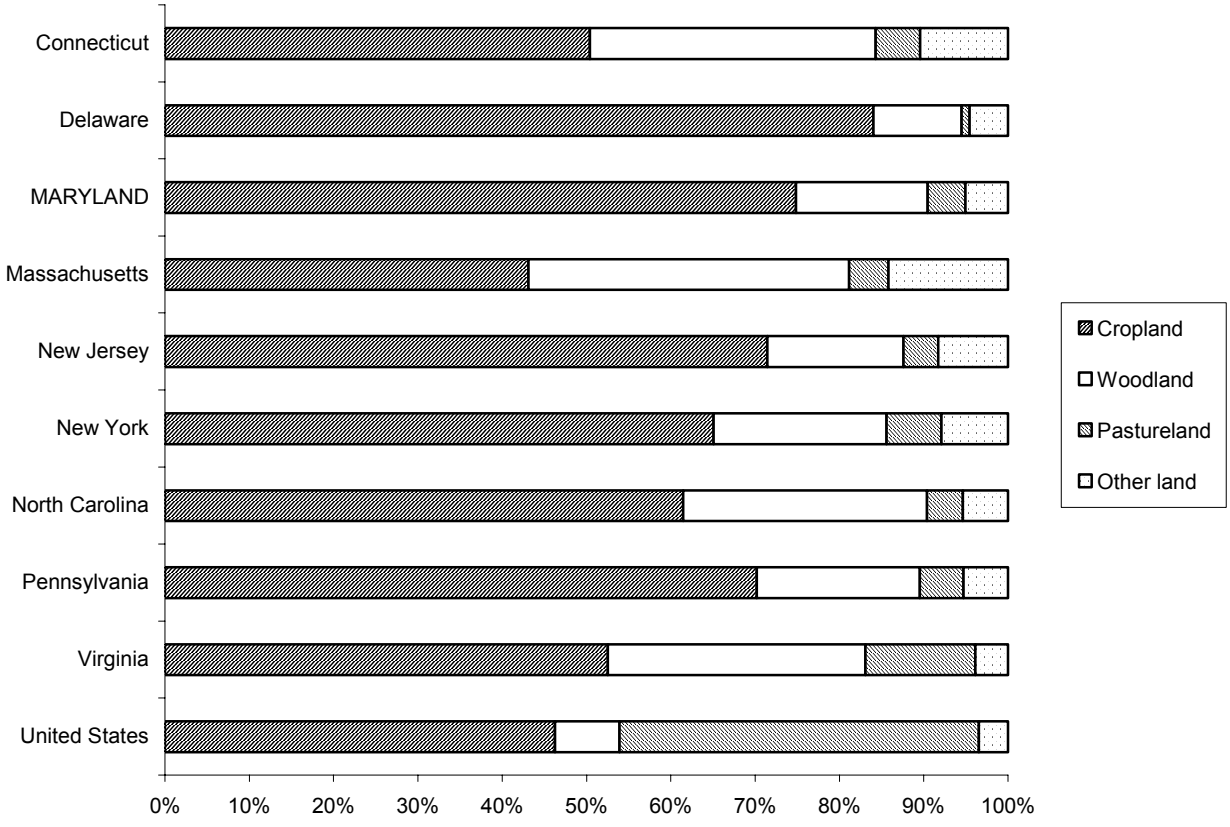

Figure 2. Agricultural Land Use, 1997: Maryland and Selected States
Source: USDA, National Agricultural Statistics Service, 1997 Census of Agriculture

Forested Land

About 40 percent (2.4 million acres) of Maryland's land area is forested, and not on farms. In addition, in 1997 336,000 acres were in woodlots on farms. The percentage of forested land is high by overall U.S. standards but relatively low for the Northeast and Mid-Atlantic states. As estimated by the Northeastern Forest Research Station, Maryland's forested area declined by 3 percent between 1986 and 1999, a rate of loss of 6,000 acres per year.

The Forest Inventory Analysis of the Northeastern Forest Research Station estimated that during 1976-86 Maryland's forests generated an average growth of 565 million board feet of sawtimber per year, of which 338 million board feet on average was removed (harvested or lost in land clearing). By 1999, the average annual growth of sawtimber had declined to 429 million board feet, and removals had declined to 273 million board feet. Thus the economically important aspect of the state's forests has been declining faster than the state's forested area. It is noteworthy also that of the removal in 1999, 63 percent was attributable to harvesting of continuing forests, while 37 percent was associated with land clearing.

The total stock of growing timber, including trees smaller than suitable for sawtimber, has been declining at a slower rate, and the rate has a perhaps unexpected regional dimension within the state, as Table 2 shows. The stock of trees is declining at an almost negligible rate in the most urbanized counties.

Table 2. Stock of Growing Timber in Maryland

	million board feet			Annual
	1986	1999	Change	% Change
Metro Counties	3503	3441	-62	-0.1%
Fringe Counties*	7601	7072	-529	-0.5%
Nonmetro Counties*	6805	5649	-1157	-1.3%
State	17910	16162	-1748	-0.8%

Source: Northeastern Forest Experiment Station

* Data for Kent (nonmetro) and Queen Anne's (fringe) counties were unavailable separately. The combined figure has been included here as part of the fringe county total. The counties in each category are listed below.

Land Use Conversion Under Economic Development

To place the declines in both farmland and forestland in a perspective that will help understand the causal factors in play, consider the conversion of land among various uses, ending with commercial and housing development. Over time, Maryland's largely forested area at first settlement has been cleared for both agriculture and development. The long-term trend is essentially a pattern of conversion to urban uses. Dispersed development has resulted in agricultural and forestland being consumed for new homes, commercial and industrial development, and transportation infrastructure at alarming rates. Between 1973 and 1997, 376,600 acres of Maryland's agricultural and forestland were converted to urban land uses; two-thirds of this land was converted to low-density residential development (Table 3).

Table 3. Land Use Change in Maryland, 1973-1997

Land Use Category	1973 Total acres	1973 Percent of land total	1997 Total acres	1997 Percent of land total
Resource lands, total	5,469,957	87.7%	5,097,880	81.6%
Agricultural land	2,424,536	38.9%	2,237,409	35.8%
Forestland	2,781,454	44.6%	2,592,026	41.5%
Other resource land	263,968	4.2%	268,445	4.3%
Urban development, total	769,648	12.3%	1,145,927	18.4%
Low density residential	241,061	3.9%	489,539	7.8%
Medium/high residential	268,748	4.3%	357,339	5.7%
Commercial/industrial/transport	112,917	1.8%	144,363	2.3%
Institutional/open	146,922	2.4%	154,686	2.5%
Total land	6,239,605	100.0%	6,243,807	100.0%

Source: Maryland Department of Planning, 2001

Of the converted land, an estimated 187,100 acres came from farmland (about 8 percent of Maryland's agricultural land in 1973) and 189,400 acres came from forestland (about 7 percent of Maryland's forestland in 1973).

Thus Maryland's 2.42 million acres of agricultural land in 1973 had decreased to 2.24 million acres by 1997.[8] The rate of loss, 7,800 acres per year, is considerably less than the average loss of 65,000 acres per year between 1945 and 1973. Within the period since 1973, the highest rate of loss of agricultural acres was between 1985 and 1990, years of high population and economic growth.[9] Agricultural land was lost at a rate of 15,750 acres per year during this period, a high rate but still less than in the 1945-73 period. The rate of conversion to development decreased to 7,100 acres per year between 1990 and 1997. The overall trend in land in farms is shown in Figure 3.

The slowdown in loss of farmland in recent years raises the question whether the loss of agricultural land is mainly a problem of the past, and of less concern for the future. The slower rate of conversion in recent years might suggest that. However, an alternative possibility is that conversion has slowed only because so little remains to convert in many parts of the state. To

[8] Note that the Census of Agriculture data noted earlier and plotted in Figure 3 are different – 2.15 million instead of 2.24 million estimated by the Maryland Department of Planning. One source of difference is that some land for agricultural purposes is located on places that do not qualify as farms under the Census definition. Another problem is that the Census misses some farms. At the national level, the 1997 Census counted 1.97 million farms while USDA's official tally is 2.19 million. In this report we use Department of Planning data when comparing land in agriculture to land in non-agricultural uses, and Census of Agriculture data when making comparisons of land use over long time periods and for different crops.

[9] Population grew at an average annual rate of 1.7 percent while jobs increased at an average annual rate of 3.5 percent.

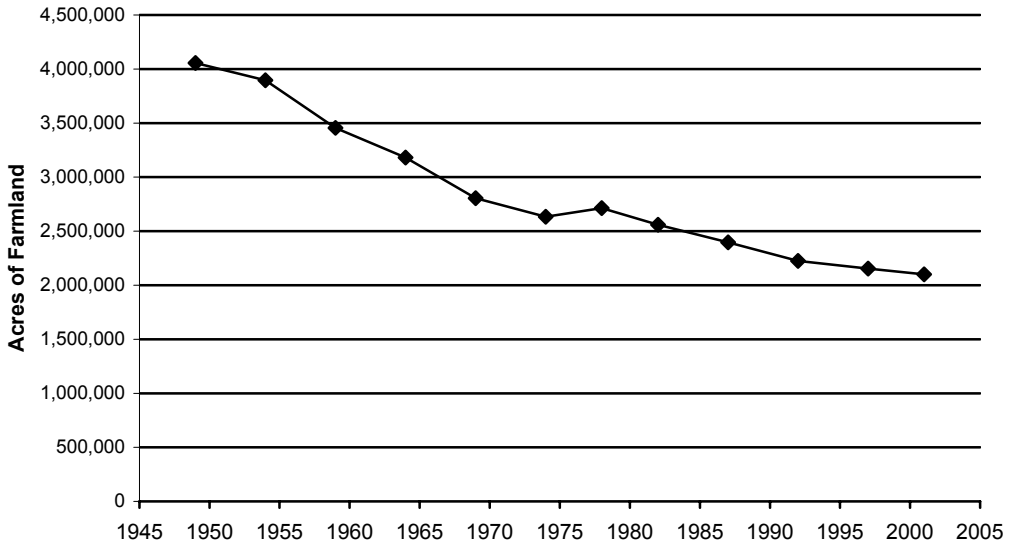

Figure 3. Maryland's Land in Farms
Source: Census of Agriculture

address this issue we need to look separately at regions within Maryland. Consider three kinds of counties: (a) those within the direct influence of metropolitan growth, including Anne Arundel, Baltimore, Howard, Montgomery, and Prince George's; (b) "fringe metro" counties on the edges of metropolitan growth, including Allegany, Calvert, Carroll, Cecil, Charles, Frederick, Harford, Queen Anne's, Washington; and (c) nonmetro counties, including Caroline, Dorchester, Garrett, Kent, Somerset, St. Mary's, Talbot, Wicomico, and Worcester.

The five most metropolitan counties account for about three-fourths of Maryland's total population of 5.38 million people (in 2001) and economic activity (3.11 million jobs in 2000). Over the last three decades, urbanization pressures within these large metropolitan counties have added over 750,000 people and 1 million jobs. In the metro fringe group of counties, population has nearly doubled over the last thirty years and the job base has more than doubled. Moreover, while housing activity was trending downward in the most metropolitan counties, annual housing permits have more than doubled in the metropolitan fringe counties since 1980, and have increased 24 percent in just the last four years, 1997-2001 (Figure 4).

Table 4 shows the annual changes in land in farms in the three regions during two periods: 1987-97, the decade previous to the latest Census of Agriculture, and for historical perspective the nearly three decades before that following the 1959 Census of Agriculture. It is true that in the category (a) counties, essentially the Baltimore-Washington corridor, the average loss of farm acreage was lower in the last ten-year period shown, even though the percentage loss was higher. So the story that loss of farmland slowed only because there was less farmland to lose applies to some extent. However, in the fringe metro counties, the loss of farmland was lower in 1987-97 in both acreage and percentage terms. In the nonmetro counties the rate of loss is consistent at just under one percent per year.

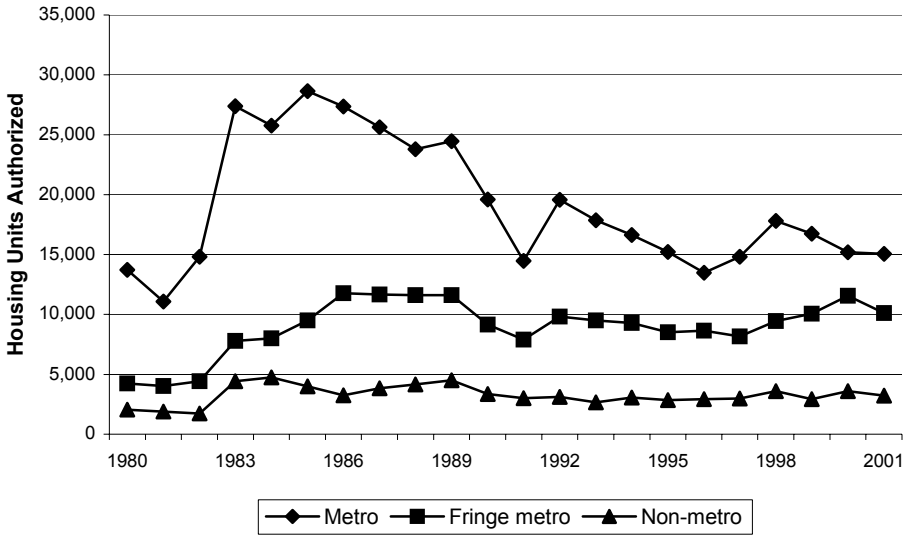

Figure 4. New Housing Units Authorized for Construction in Maryland, 1980-2000
Source: Maryland Department of Planning

Table 4. Changes in Farmland, Three Regions of Maryland

	1959-87	1959-87	1987-97	1987-97
	acres per year	% per year	acres per year	% per year
(a) large metro counties	-9,534	-2.00%	-7,979	-2.55%
(b) fringe metro counties	-17,442	-1.36%	-7,448	-0.73%
(c) non-metro counties	-10,886	-0.96%	-8,749	-0.93%

Figure 5 shows the decline of farm acreage over time for each region. Even if the rate of loss is lower in recent years, the trend toward a declining farmland base is evident in every type of county. However, the situation with respect to cropland harvested is different, as shown in Figure 6. The trend declines are much less pronounced in all but the large metro counties. The greater decrease in total farmland than in cropland indicates that grassland and woodlots decreased more than cropland. That suggests higher economic returns to cropland, so that cropland is less likely to be converted to urban and other uses than other farmland.

The increase in cropland in the 1970s ran counter to the long-term decreases. This increase was due to higher grain and wheat prices during this period. With higher prices, land was converted from other uses, which would not have been profitable with lower prices in previous and subsequent periods. These trends indicate that land in crops is responsive to national agricultural prices; long-term trends in cropland can be reversed with high enough prices. However, these 1970s prices depended on an unsustainable commodity boom.

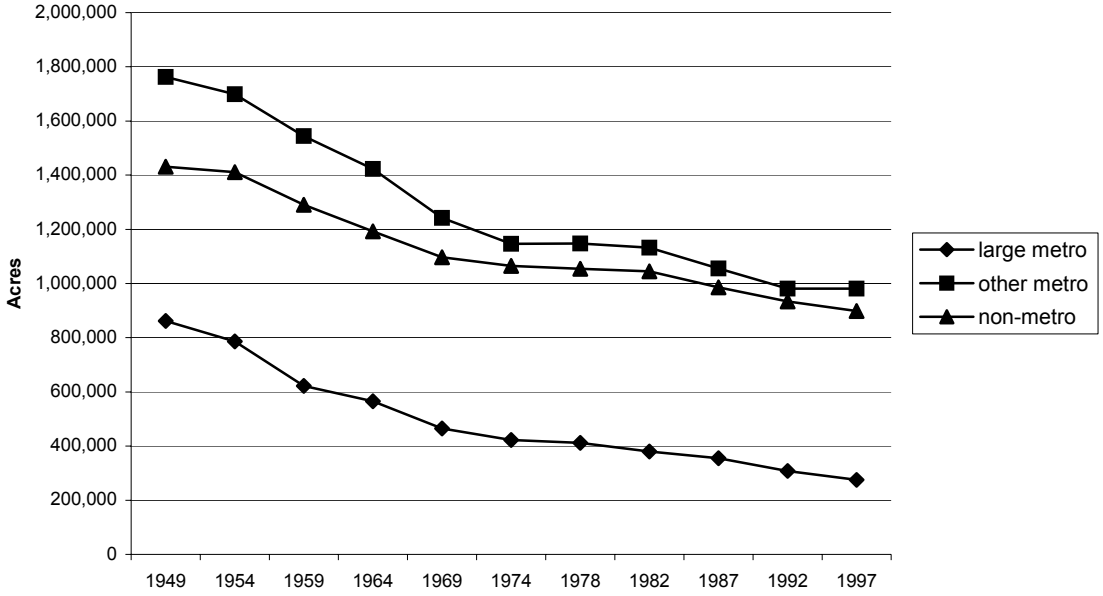

Figure 5. Land in Farms: Three Types of Counties
Source: Census of Agriculture

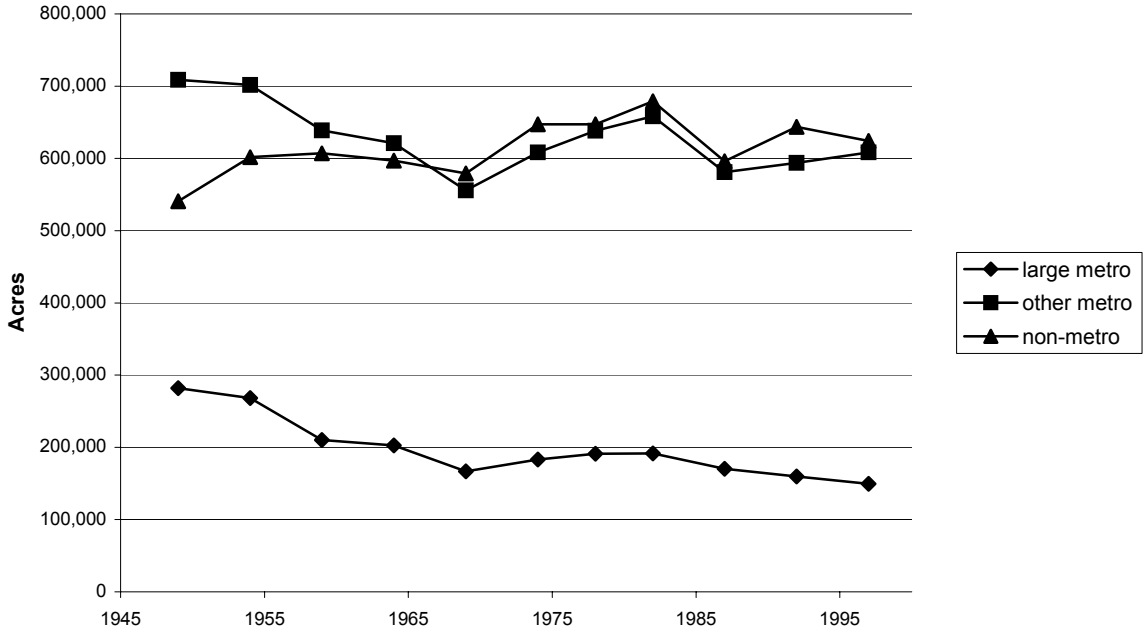

Figure 6. Harvested Cropland, Three Types of Counties
Source: Census of Agriculture

Farm Numbers

The importance of agriculture depends not just on having land devoted to agriculture, but even more on the farming activities that take place on that land. Maryland has 12,400 farms producing more than 150 different crops and livestock products. Farms vary widely in economic activity and environmental impact per acre, from low-value, low-impact farming such as growing hay, to high-value, high-impact enterprises such as concentrated animal feeding operations.

USDA's count of farm numbers depends on how a farm is defined, and this is a matter of controversy. The current definition, in use since 1974, defines a farm as a place from which $1,000 or more of farm products are sold or normally would be sold. This definition includes many farm operations that are commercially negligible and incapable of generating a living. Nonetheless, small farms are the means of keeping a substantial amount of land area in agriculture, and should not be neglected.

Table 5 shows the trends in farm numbers, land in farms, and average farm size in Maryland as compared to the United States as a whole. In the period between 1949 and 2001, Maryland lost 48 percent of its land in farms, and since 1987 Maryland has lost 12 percent of the farmland that remained in that year. The comparable percentage losses for the U.S. as a whole are 19 percent and 2 percent. The fact that land in farms has gone out of agriculture at a more rapid pace in Maryland than in the U.S., while the difference in the rates of attrition of farm numbers is smaller, implies that Maryland's average farm size has increased less rapidly than that of the

Table 5. Farm Acreage, Number of Farms, and Acres per Farm, 1949-1997

	Maryland			United States		
Year	Number of Farms	Land in Farms (1,000 acres)	Average Farm Size (acres)	Number of Farms (1,000 farms)	Land in Farms (1,000 acres)	Average Farm Size (acres)
1949	36,107	4,056	112	5,388	1,161,420	216
1954	32,500	3,897	120	4,782	1,158,192	242
1959	25,122	3,457	138	3,711	1,123,508	303
1964	20,760	3,181	153	3,155	1,110,187	352
1969	17,181	2,803	163	2,730	1,062,893	389
1974	15,163	2,634	174	2,314	1,017,030	440
1978	15,540	2,614	168	2,258	1,014,777	449
1982	16,183	2,558	158	2,241	986,797	440
1987	14,776	2,397	162	2,088	964,471	462
1992	13,037	2,223	171	2,116	978,500	464
1997	12,500	2,200	176	2,190	956,000	436
2000	12,400	2,100	169	2,157	941,200	436

Source: U.S. Census of Agriculture data, except 1997 and 2000, which are USDA's official farm count (which add farms estimated to have been missed by the Census).

nation as a whole, as Table 5 shows. Maryland's farms have always been smaller than the U.S. average, and the difference has widened in recent years. Even in the eight least metropolitan counties of Maryland, group (c) as defined earlier, average farm size in 1997 was 229 acres, less than half the U.S. average.

Farm size in Maryland has grown in a way similar to neighboring states, as Figure 7 shows. All the Northeastern and Mid-Atlantic states have smaller farms than the U.S. on average. Over the last two decades the average size of Maryland's farms has grown faster than farms in these other states.

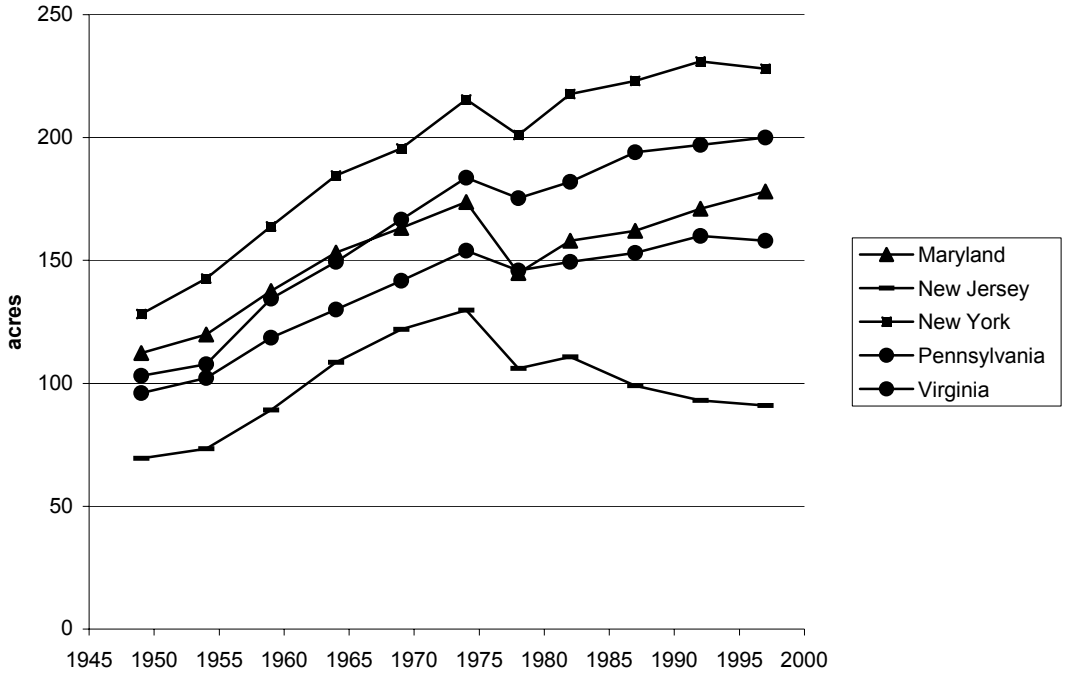

Figure 7. Average Size of Farms
Source: Census of Agriculture

Economics of Maryland Agriculture

Changes in land in farms, farm numbers, and farm size reflect the economic realities that farmers have to deal with. Farming has to generate returns that warrant continuation in agricultural production rather than turning to outside sources of earnings and renting out or selling the land. And, if agriculture is to flourish in the future, the expected returns to farming have to be sufficient to repay the costs of investment to maintain and improve the capital stock and to adopt new technologies that emerge.

Table 6 provides data on the value of farm output, the estimated costs of major inputs, and capital consumption (depreciation) for 1990 and 2000. Figure 8 shows the total value of output and net farm income as estimated by the Economic Research Service of USDA. Figure 9 uses

Table 6. Revenue Sources and Cost Items, Maryland Farms

Revenue Sources:	1990	2000
	(thousand dollars)	
Final crop output	550,015	659,843
Final animal output	825,192	841,101
Services and forestry	173,518	250,057
Machine hire and custom work	12,321	12,606
Forest products sold	23,000	33,080
Other farm income	59,883	108,074
Gross imputed rental value of farm dwellings	78,314	96,297
Inventory and other adjustments	-173,518	-250,057
Direct government payments	17,386	88,470
Costs:		
Manufactured inputs and services bought	228,601	283,729
Fertilizers and lime	63,256	63,020
Pesticides	30,624	43,453
Petroleum fuel and oils	34,181	41,350
Electricity	17,299	21,508
Repair and maintenance of capital items	67,334	87,134
Machine hire and custom work	15,907	27,264
Marketing, storage, and transportation expenses	70,003	59,793
Contract labor	4,162	4,775
Miscellaneous expenses	139,105	197,525
Motor vehicle registration and licensing fees	2,390	2,512
Property taxes	34,307	37,184
Capital consumption	145,513	139,451
Hired labor	93,093	122,701
Net rent paid for leased land	29,021	30,377
Interest payments	84,851	82,963
Total of Costs	976,406	1,130,341

Source: U.S. Department of Agriculture, Economic Research Service

the same data for a longer time period, and to adjust for inflation deflates the dollar values to give estimates of real income. Figure 9 shows real net income per farm in Maryland, and for comparison also shows Virginia, Pennsylvania, and the U.S. as a whole. By this measure Maryland farms are doing well compared to other states, both in trend and recent levels. This is especially notable given that Maryland's farms are only half the size of U.S. farm on average in terms of acreage, pointing to higher value-added per acre in Maryland agriculture. However, the national trends are not favorable in that net farm income has been stagnant throughout the country in recent years.

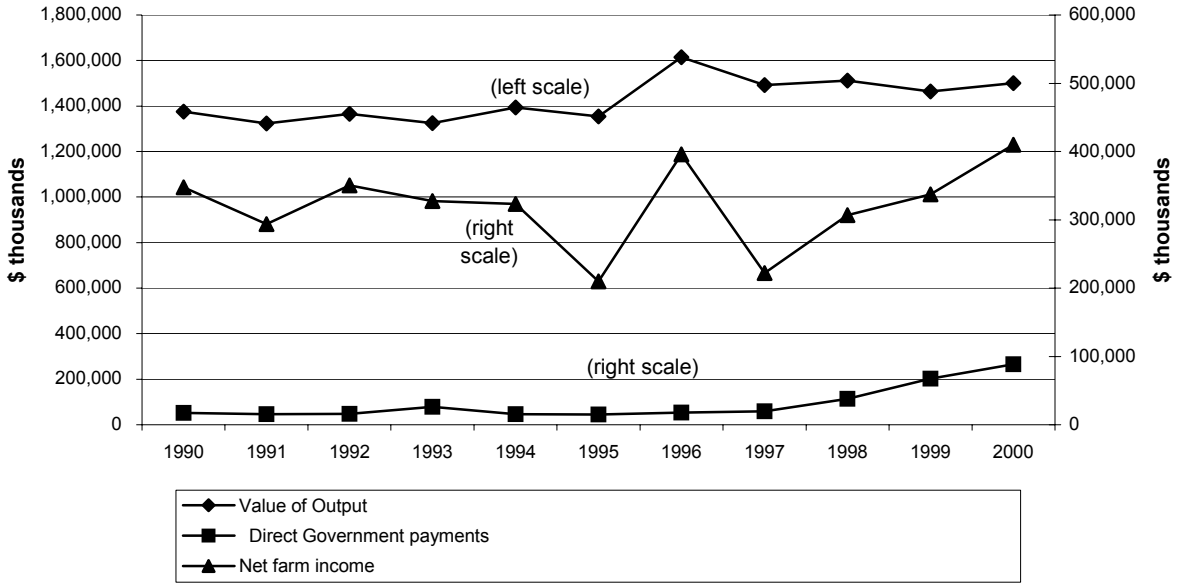

Figure 8. Maryland Agricultural Output, Income, and Government Payments
Source: USDA, ERS

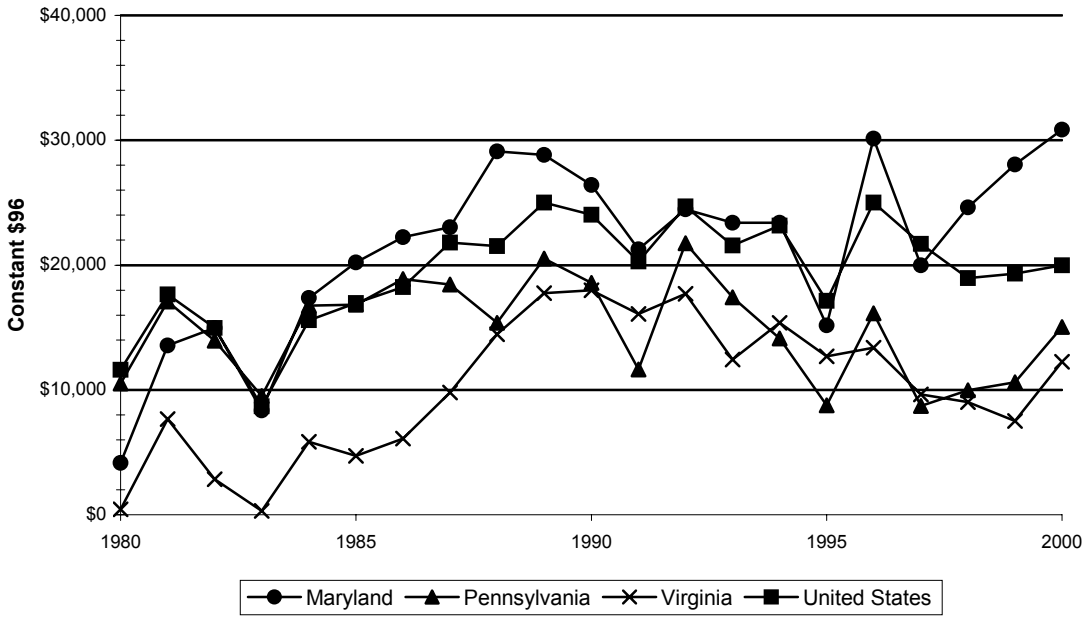

Figure 9. Real Net Farm Income per Farm, 1980-2000
Source: USDA, ERS, and authors' calculations

It is also important to note that $30,000 in net farm income indicates only a modest return to investment in agriculture. The average Maryland farm in 2000 had an estimated net worth of

$545,000. A return of 4 percent on this investment would be $21,800, leaving less than $10,000 return to the farm operator's and family labor. [10]

Several complications have to be addressed in order to obtain a comprehensive and accurate picture of the economic situation. First, farmland is a valuable asset that has grown significantly in value over time, and this reduces the necessity for current returns to cover the costs of ownership of farmland. Second, debt held by many farmers, especially younger farmers or those who have recently expanded or modernized their operations, complicates the story. Third, off-farm income earned by most farm households adds another source of capital and funds for living expenses. Fourth, there are important differences between the situations of farms of different kinds, most notably between large, full-time farming operations and small part-time farms. Fifth, the role of government programs, particularly the federal commodity support programs. These complications will each be addressed in this section except the matter of government programs, which will be discussed in the policy section later.

Capital Gains on Farmland

Figure 10 shows the value of an average acre of farmland in Maryland and the United States as a whole. The dollar values are "real" in the sense that they are deflated by the overall price level (the GDP deflator) so that the increases shown are not the result of inflation reducing the real value of a dollar. So when the price of land doubles in Figure 10, this means not just that an acre of land sells for twice as much, but that an acre of land buys twice as much of other goods and services in the economy.

In Maryland as in the U.S. as a whole, farmland values rose steadily through the 1950s and 1960s, accelerated in 1975-1982, and then crashed in the farm crisis of the 1980s. Since 1990 a small upward trend in real land prices of about one percent per year has resumed. Overall, Maryland's land prices have increased at a more rapid pace than in the nation as a whole. Maryland farmland sold for a little less than twice the U.S. average price per acre in 1950, but well over three times the U.S. average price in 2000.

Maryland's high farmland values bring both good news and bad news for the economic viability of agriculture. The good news is that the increases in value compensate in part for the low current-income returns to farming, making agriculture more economically feasible than it would otherwise be. Providers of agricultural loans are happier to continue financing and farmers can see gains that, even if not currently available for consumption or investment, will provide the basis for income in retirement.

On the other hand, the increasing land values may reflect not so much agricultural prospects for farm acreage as development potential. The market is sending signals that Maryland's land is becoming less competitive for use in agriculture as compared to development. This is apparent not only in the land conversion data that have already been presented, but also in the fact that

[10] The U.S. and state-level income and net worth data in this report are estimates made by the Economic Research Service of USDA, and are mostly available on their Website, http://www.ers.usda.gov. The net income estimate has already subtracted out a capital consumption (depreciation) allowance and property taxes, so the 4 percent would truly be a net return after depreciation (and after property taxes but not income taxes).

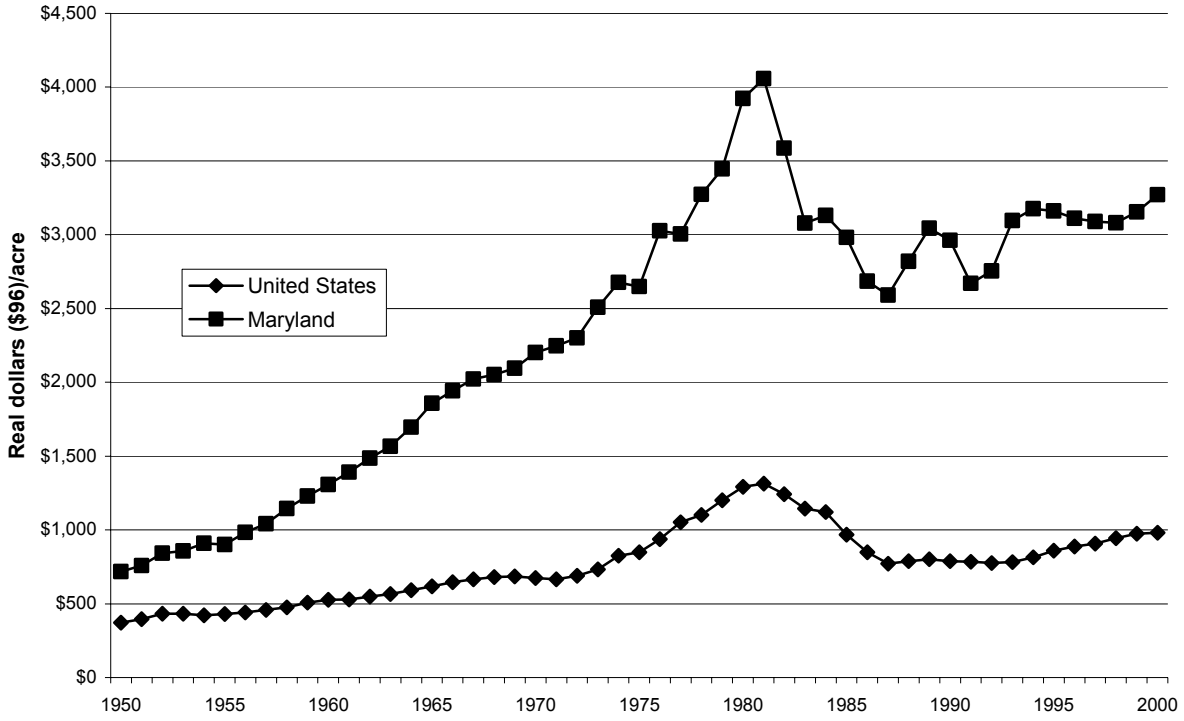

Figure 10. Real Farmland Values in Maryland and United States, 1950-2000
Source: Census of Agriculture

while Maryland's sales value of land is high relative to Midwestern farmland, the rental value of Maryland's farmland is substantially lower on average (for details see Figure 26 below). So it is not the value of land in farming that makes Maryland's farmland exceptionally valuable. This is not a promising situation for the future of agriculture.

Farm Debt

To place Maryland's farm assets and debts in perspective, Table 7 shows details of both, with net worth (or equity) derived as assets minus debts. Maryland farms have over a billion dollars in debt, two-thirds of it borrowed against real estate. But the ratio of farm debt to assets remains low, fluctuating around an average level of about 15 in recent years, slightly below the debt/asset ratio of all U.S. farms (Figure 11).

These averages do not convey the problems that some heavily indebted farm operations encounter because many debt-free farms are averaged in with others that have debts so high relative to assets that their financial viability is in question. The Economic Research Service of USDA has constructed indicators of financial stress covering farms ranging from those having insufficient cash flow to those who are facing imminent bankruptcy. In the farm crisis of the mid-1980s almost 1 in 7 U.S. commercial farms were estimated by USDA to be under severe financial stress. Since that time asset values have increased and farmers have been more

Table 7. Balance Sheet of Maryland Farms

	Thousand Dollars	Dollars Per Farm
Farm assets	7,899,247	637,036
Real estate	6,674,009	538,227
Livestock and poultry	222,274	17,925
Machinery and motor vehicles	553,537	44,640
Crops	100,122	8,074
Purchased inputs	37,581	3,031
Financial	311,724	25,139
Farm debt	1,134,068	91,457
Real estate	661,279	53,329
Farm Credit System	326,837	26,358
Farm Service Agency	15,057	1,214
Commercial banks	161,706	13,041
Life insurance companies	24,435	1,971
Individuals and others	133,243	10,745
Non real estate	472,789	38,128
USDA, Farm Credit System	206,607	16,662
USDA, Farm Service Agency	14,305	1,154
Commercial banks	58,557	4,722
Individuals and others	193,320	15,590
Equity	6,765,179	545,579
Ratio		
Debt/equity	16.8	
Debt/assets	14.4	

Source: USDA, Economic Research Service

cautious in taking on debt. In Maryland, the incidence of financial stress was less than in the U.S. as a whole because land values did not decline as much as in the Midwest, and farmers' income sources tend to be more diversified. In Maryland as in the country as a whole, the quality of farm balance sheets improved in the 1990s. Even after the poor crop years of the late 1990s, financial problems are not evident in the state-aggregate data.

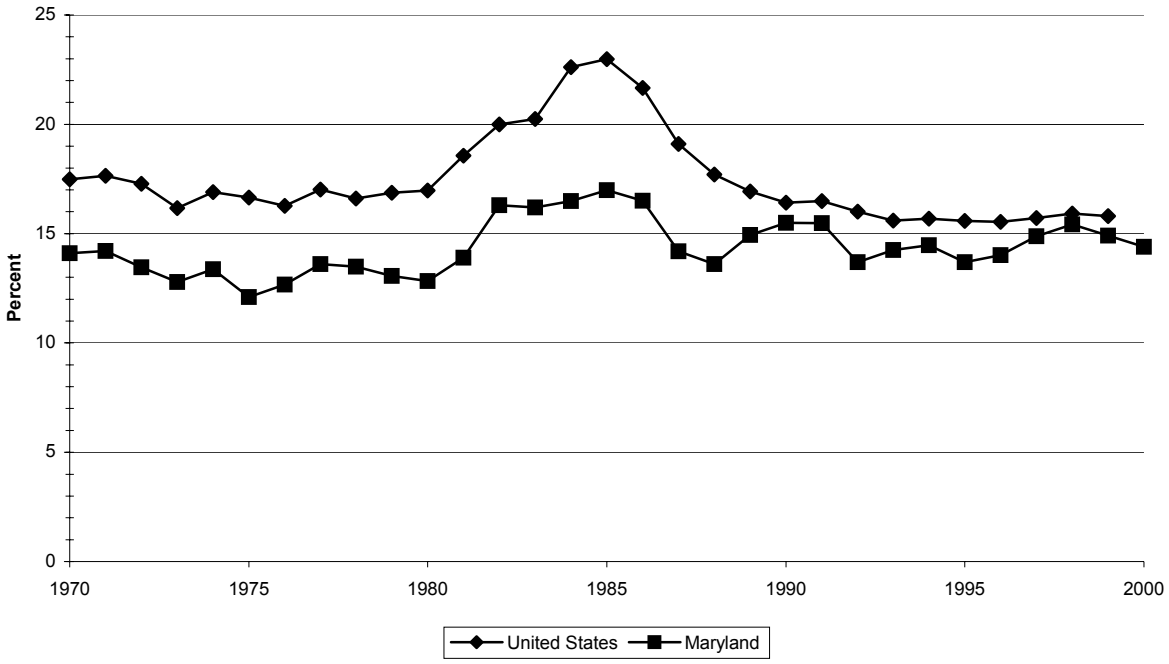

Figure 11. Farm Debt to Asset Ratio, 1970-2000
Source: USDA, Economic Research Service

The question remains however of the size of the minority of farms that are in financial trouble. Farms go out of business each year, some of them because of foreclosure or looming insolvency. Comprehensive data to address this issue are not available, but for purposes of this study the MidAtlantic Farm Credit cooperative provided summary data for farms in their portfolio of loans in Maryland that provide some evidence of problems. In financial data for 2,858 farms that have borrowed from MidAtlantic Farm Credit, their ratios of debt to assets are as follows:

ratio of debts/assets	number of farms
greater than 1	21
0.75-1.0	160
0.50-0.75	514
0.25-0.50	1098
0.0-0.25	1044

Only 21 farms, less than one percent of the total, have recorded total liabilities in excess of their assets, and in that sense are technically insolvent. Even some of these farms have substantial net incomes and debts small enough relative to them that debt service appears feasible. But some of the 160 enterprises with ratios of debts to assets greater than 0.75 may also be in an unsustainable financial situation. Overall, however, the data indicate that while the financial condition of Maryland farms varies greatly, severe financial difficulties are relatively rare.

Off-Farm Income

In Maryland as elsewhere most farm operators supplement net farm income with income from various off-farm sources. The importance of off-farm income has increased over time. For the U.S. as a whole, in 1960, net farm income constituted 47 percent of average farm household total income, while off-farm income accounted for 53 percent. By 1998, the proportion of total household income contributed by net farm income had declined to 12 percent, while income from off-farm sources accounted for the balance of 88 percent (USDA, ERS, 2001). Thus, despite historically low prices for a number of major commodities and financial vulnerability for many farmers,[11] off-farm income has made it possible for many loss-making farms to survive and for their households to enjoy a reasonable standard of living. Indeed, the average U.S. farm household in 1999 (latest year available) had an income of $64,300 while its counterpart nonfarm household averaged $54,800, according to USDA estimates (*Agricultural Outlook,* Jan. 2002, Table 31). Increased dependence on off-farm income sources has made the nonfarm economy essential to farm households, especially for small-farm operators.[12]

In Maryland, off-farm income accounted for an estimated 70 percent of the average farm household's total income in 1999. Farm households in other states, such as Virginia, Pennsylvania, and New Jersey, had even higher off-farm income shares (Figure 12).[13] In the 1997 Census of Agriculture, 45 percent of Maryland farm operators reported working off the farm 100 or more days per year. This percentage has been essentially constant through the 1980s and 1990s, and is above Pennsylvania's 41 percent but below Virginia's 49 percent.

Off-farm income comes from a variety of sources, as itemized in Table 8. Wages from nonfarm jobs represent the greatest share of the 1999 total of $120.1 billion, followed by net income received from other (nonfarm-related) business interests, and retirement, disability, and other public assistance payments (e.g., supplemental security income, unemployment compensation). Income from interest and dividends as well as other income sources (e.g., net income from estates and trusts, rental income from nonfarm properties, annuities, alimony, gifts and inheritance, and net gain from sales of real estate, stocks, and bonds) have increased in recent years. Net income received from farms other than that of the operator represents the lowest share of all of the off-farm sources for the nation as well as each of the selected states.

[11] According to the USDA Economic Research Service, more than 170,000 farms (about 8 percent of all farms) were classified as financially vulnerable or marginally solvent in 1999.

[12] There is thus a symbiotic economic relationship between farm operators and rural communities. Rural communities represent the settings for non-farm jobs for farm operators and their families. In turn, rural communities depend upon farm operators for market outlets, farm inputs and services, and farm household retail expenditures.

[13] The data in Figure 12 are from two different sources: off-farm income from the 1999 follow-on survey of the 1997 Census of Agriculture, and farm income from USDA's state-aggregate estimates. The USDA estimate at the U.S. level quoted in the preceding paragraph comes from a different estimating procedure based on USDA's annual Agricultural Resource Management Survey. That estimate is lower ($64,300 in the preceding paragraph compared to $69,500 in Figure 12) because the ARMS survey gives much lower estimates of net farm income than the aggregate data do. One reason for this is that the aggregate data include net farm income accruing to contractors who are not farmers. We use the aggregate data here because state-level ARMS data on net income are not available.

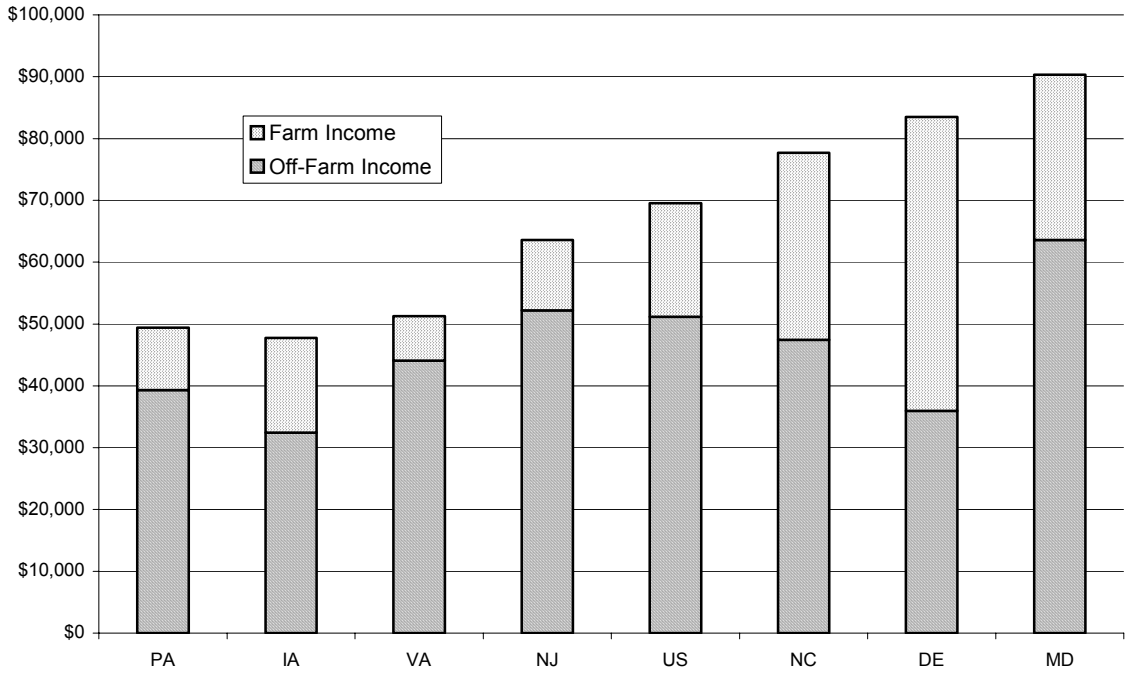

Figure 12. 1999 Net Farm Income and Off-Farm Income per Farm, for U.S. and Selected States
Sources: USDA, Economic Research Service, *Net Agricultural Value-Added* tables; USDA, National Agricultural Statistics Service, *Agricultural Economics and Land Ownership Survey, 1999*

Table 8. Off-Farm Income by Source, 1999

Source of Income	MD	DE	PA	VA	IA	CA	U.S.
Wages paid to household members	5.1%	7.5%	3.8%	1.2%	4.9%	4.6%	2.3%
Net income received from another farm	1.4%	0.8%	1.2%	0.8%	3.3%	2.5%	1.9%
Net income from any other business	18.4%	20.5%	11.4%	15.0%	9.7%	21.9%	19.5%
Wages from nonfarm jobs	44.5%	50.4%	60.3%	58.0%	60.8%	33.2%	52.1%
Retirement, disability or other public assistance	8.5%	7.7%	12.5%	9.9%	10.2%	16.2%	10.1%
Interest or dividends	7.2%	6.1%	6.3%	5.8%	5.1%	10.0%	6.8%
All other sources of income	15.0%	7.1%	4.5%	9.2%	5.9%	11.6%	7.3%

Source: USDA, National Agricultural Statistics Service (2001). *Agricultural Economics and Land Ownership Survey* (1999).

Types and Structure of Farms

Data on the average of all farms can be highly misleading because farms differ so much in their characteristics. The most important distinction is between commercial farms whose

households rely primarily on income generated by the farm operator, and the typically smaller farms that rely primarily on off-farm income sources as the source of living expenses. The most commonly used indicator of whether a farm is large enough to be a fully commercial operation in this sense is the value of sales from the farm. USDA's Economic Research Service has developed a typology of farms in which farms with sales of less than $250,000 per year are called "small" in contrast to those above that sales level. However, many farms with less than $250,000 in sales are commercial in the sense that they involve full-time employment of the operator – for example, 60- to 80-cow dairy herds would typically generate less than $250,000 in sales. For purposes of this report, we will also consider farms with sales of between $100,000 and $250,000 as ones that may be commercially viable as the main source of the operator's income. For a detailed discussion of smaller farms, see Annex VII.

Figure 13 shows more details of the dispersion of farms by value of sales. The bar for sales of farms over $1,000,000 indicates that less than 2 percent of farms are in this category, yet they account for 30 percent of Maryland's sales of farm products. At the other end of the scale, half of the state's farms have sales of $10,000 or less, but altogether they account for less than 2 percent of aggregate sales. The top four sales categories, which include all farms with sales of $100,000 or more, have 21.5 percent of Maryland's farms but account for about 90 percent of aggregate sales of farm products. Thus, these farms comprise the bulk of Maryland agriculture in the sense of contribution to the state's output as well as being the set of farms whose operators are economically most dependent on agriculture.

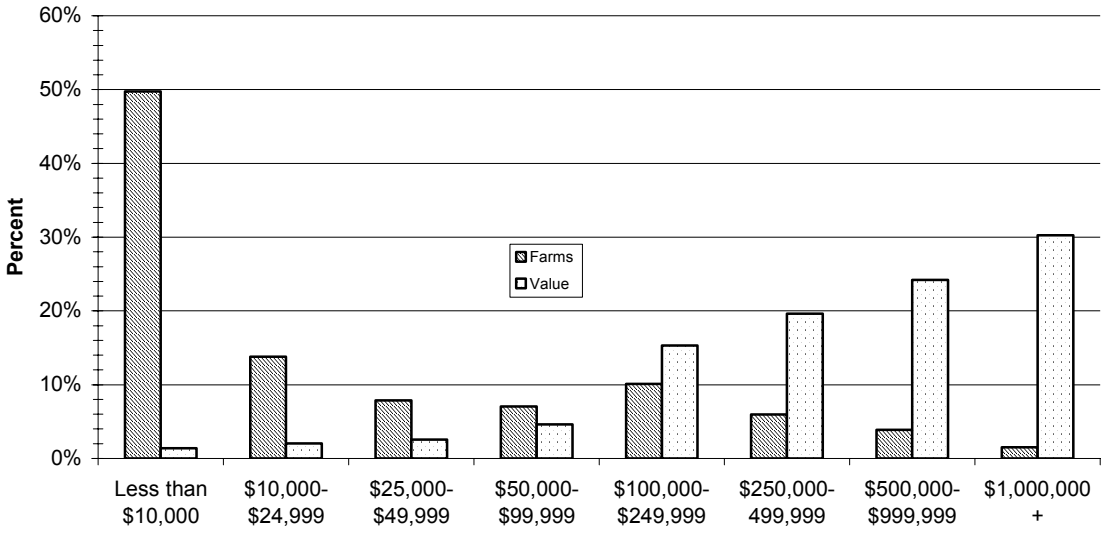

Figure 13. Share of Maryland Farms and Market Value of Agricultural Products Sold, by Sales Category, 1997
Source: 1997 Census of Agriculture

Table 9a shows how different the economic situation is for these two categories of farms. Average sales of the commercial farms is $452,000, and of the smaller ones $15,000. Net cash returns on the average commercial farms, as reported in the 1997 Census of Agriculture, was $82,000. Setting aside $40,000 for operator and family labor, this leaves $47,000 to cover

Table 9a. Maryland Farms by Sales Category, 1997

	$100,000+	less than $100,000
farms	2,597	9,487
% of state's farms	21.5	78.5
acres per farm	475	97
% of state's total	57.2%	42.8%
cash farm income per farm[a] (thousand dollars)	82	-2
value of real estate per farm (dollars)	1,265,691	372,826
% land owned	41.9%	73.0%
value of capital equipment per farm (dollars)	151,213	35,343
rate of return[b]	5.1%	-7.9%

[a] Cash receipts plus government payments plus payments for services to other farms minus expenses for purchased inputs, livestock, interest on farm debt, property taxes, hired labor, machinery repair and maintenance, and rental payments for leased land.

[b] Cash farm income minus $40,000 for operator labor ($20,000 for smaller farms) minus 5 percent depreciation of capital equipment, divided by value of farm real estate times percent owned plus value of capital equipment.

Source: 1997 Census of Agriculture

depreciation and return to investment, yielding a rate of return that is roughly 5 percent. In contrast, the smaller farms had negative average net cash return, a loss of $2,000, a negative rate of return to capital invested, and no return to the operator's labor. This average does not pertain to all small farms, of course. The Census reports that 37 percent of Maryland's farms with less than $100,000 in sales had positive net cash returns; but the losses of the other 63 percent outweighed the gains in calculating the average.

It is also important to note that land in farms is concentrated on relatively few farms, although not so intensely concentrated as farm sales. Figure 14 shows the extent of concentration of farm acreage on the largest farms in Maryland, compared to comparable information for the United States as a whole. The diagram plots the cumulative percentage of farms against the cumulative percentage of all land in farms, starting from the smallest. Thus the diagram for Maryland shows that the smallest 50 percent of farms have 10 percent of Maryland's land in farms; note that the smallest 80 percent of farms have about 32 percent of the land. That is, the largest 20 percent account for 68 percent of the state's farmland. Thus the concentration of land on the largest farms is less than the concentration of farm sales.

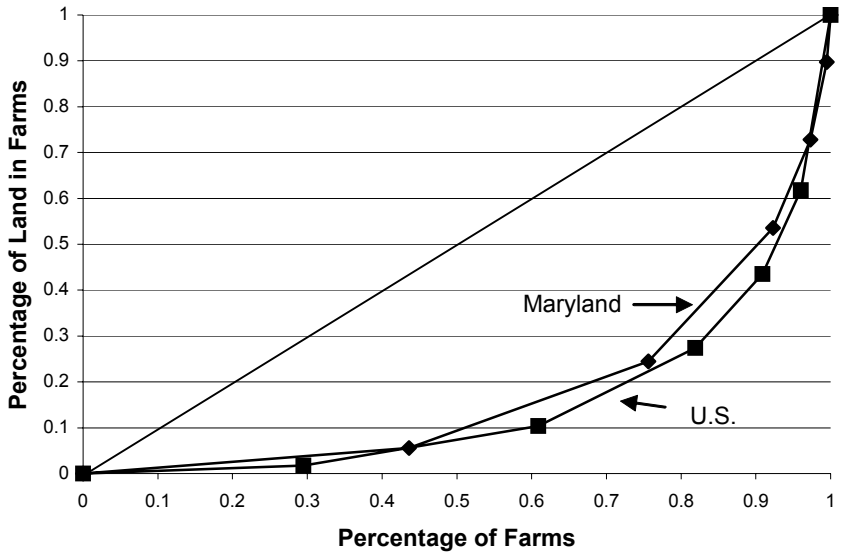

Figure 14. Concentration of Acreage
Source: 1997 Census of Agriculture

If land were evenly distributed across farms – i.e., if they were all the same size – the curves shown would instead be the straight line shown on the diagonal from 0,0 to 1,1. At the other extreme, if one farm had essentially all the land and the rest had negligibly tiny plots, the curves would follow the horizontal axis at zero and then the vertical axis at 1. Thus the extent to which the concentration curves are bowed out away from the diagonal is a measure of the concentration of farmland. As Figure 14 shows, that concentration is slightly greater for the United States as a whole than for Maryland. So, for example, the largest 10 percent of U.S. farms have 59 percent of U.S. farmland, while the largest 10 percent of Maryland farms have 50 percent of Maryland's farmland.

While Maryland's smaller farms are economically less important than larger farms in terms of agricultural output, they are responsible for the stewardship of a substantial share of the state's farmland. Table 9a indicates that farms with less than $100,000 in sales operated 43 percent of the state land in farms. The share of land in farms that are small in terms of acreage (less than 140 acres) is only 17 percent in 1997 (Table 9b). But their share in the value of the state's agricultural sales has not declined over the past two decades. Indeed, the smallest category of farms, those of under 50 acres, have seen their share of the Maryland's farm sales increase from 17 percent in 1964 to 28 percent in 1997. This reflects the increasing importance of relatively high-value output from smaller farms. That 28 percent of output is produced on only 5 percent of the state's farmland. Note also that 43 percent of Maryland's farms are in the category of 50 acres or less, and that this percentage is no longer declining over time. The development of high-value farming on these enterprises is likely to be even more important in the future.[14]

[14] By way of comparison, for the United States as a whole, 30 percent of all farms operated less than 50 acres, and they accounted for only one percent of all farmland and 10 percent of farm sales in 1997.

Table 9b. Maryland Farms by Acreage Category

		Acres in farm		
		<50	**50-139**	**140+**
1997	% of all farms	43%	25%	31%
	% of farmland	5%	12%	83%
	% of all product sales	28%	14%	58%
1987	% of farms	42%	27%	31%
	% of farmland	5%	14%	81%
	% of product sales	28%	14%	58%
1978	% of farms	44%	26%	30%
	% of farmland	6%	16%	79%
	% of product sales	23%	14%	62%
1964	% of farms	32%	31%	37%
	% of farmland	4%	18%	77%
	% of product sales	17%	18%	65%

Source: Censuses of Agriculture

Because of both off-farm income and relatively high-valued output, Maryland's smaller farms, like those elsewhere in the United States, do not tend to have low incomes or to be in a financially precarious situation. USDA surveys do not permit state-level analysis of off-farm income by size of farm, but the MidAtlantic Farm Credit data utilized earlier provide relevant information for about a fourth of all Maryland's farms.

gross income (sales) category	number of farms	net income from farm	off-farm income
less than $50,000	780	$200	$116,800
$50,000 - $250,000	876	$42,000	$95,000
$250,000 - $1,000,000	480	$114,000	$48,000
$1,000,000 +	85	$359,000	$93,000

These farms are not representative of all Maryland's farm population. They have higher incomes than the average of all farms as shown in Table 9a. Many smaller farms and those owned by older operators are not commercial borrowers, and they are likely to be smaller and lower-income people. Nonetheless, these borrowers are a reasonable set to look at in judging the

situation of commercial farm enterprises in Maryland. Twenty-two of them have negative total (farm plus off-farm) incomes, and the six of those that have debt/asset ratios of more than 0.5 may well be in serious financial trouble. But six out of more than 2,800 surveyed is not a high incidence of trouble compared with other small businesses.

Resource Base for Maryland Agriculture

Cropland is rightly the natural resource that gets most attention in discussion of the future of Maryland agriculture, but other natural resources are important also. This section outlines the situation with respect to two of them: water and forest resources.

Water resources. The Mid-Atlantic region is normally endowed with adequate rainfall, evenly distributed throughout the growing season. But growing conditions vary significantly from year to year, and severely debilitating droughts, such as those that plagued large parts of the state in 1997-99, add significantly to the economic risks faced by Maryland's farmers. In 2002 drought is again a major problem. Over the longer term, the record of corn and soybean yields shows the instability resulting from weather variability (Figure 15). Maryland's yields of both corn and soybeans are more volatile from year to year than U.S. average yields (although many other individual states have equally volatile yields, which are averaged out in the U.S. average yield). Note also that the average yield level of both crops is slightly below the U.S. national average.

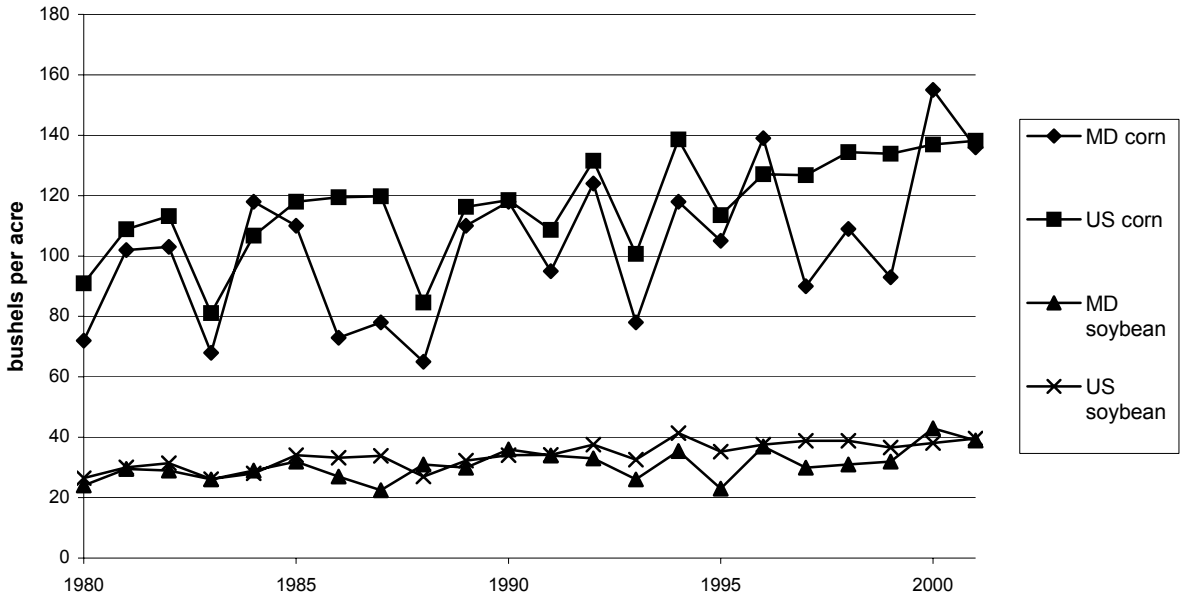

Figure 15. Corn and Soybean Yields per Harvested Acre
Source: USDA, National Agricultural Statistics Service

Despite the risks of occasional drought, irrigation has typically not been judged a worthwhile investment in Maryland, as elsewhere in the eastern United States. The exceptions are areas, mostly on the Eastern Shore, where groundwater is easy to find at low depth. In Caroline and

Dorchester counties over 20 percent of farms irrigate some of their land. Irrigated acreage is increasing over time, as the data of Table 10 indicate. The percentage of farms with irrigation and the percentage of acreage irrigated have tripled in the last 25 years. Irrigated crop acres were 22,035 for vegetables, 19,763 for corn, 16,821 for soybeans, and 4,575 for wheat in 1997. Sixty-two percent of Maryland's acreage of vegetables is irrigated, compared to 4.8 percent of corn, 3.3 percent of soybeans, and 2.3 percent of wheat. Irrigation is especially helpful in vegetable production to ensure the quantity and quality of these high value crops. A larger percentage of corn is irrigated than other field crops because it is the most susceptible to dry periods during the growing season. The current concerns in this respect involve the possibility of limited availability of water for irrigation purposes in future years. These concerns have been heightened by extended periods of low rainfall in 1997-99 and again in 2002.

Table 10. Farms with Irrigation in Maryland and United States, 1974-1997

	Maryland				U.S.	
Census Year	Farms with Irrigation	Irrigated Acres	Percent of Total Farms	Percent of Total Acres	Percent of Total Farms	Percent of Total Acres
1974	499	22,629	3.3%	0.9%	9.6%	4.1%
1978	616	28,467	4.0%	1.1%	11.5%	5.0%
1982	845	38,556	5.2%	1.5%	11.6%	5.0%
1987	1,074	50,762	7.3%	2.1%	13.2%	4.8%
1992	1,063	56,913	8.2%	2.6%	13.3%	5.2%
1997	1,154	68,588	9.5%	3.2%	12.8%	5.9%

Source: Census of Agriculture

Water has become a limiting resource for Maryland agriculture in a more subtle way, namely through the role of farming in maintaining water quality at off-farm locations. This issue will be discussed at length later.

Forest resources. Almost half of Maryland's land is forested, and is thus automatically central to any discussion of land use – even though issues in this area are typically much less prominent than agricultural or development uses in the news. Of land in farms, about 17 percent is classified as woodland. Farm woodlots receive less attention than cropland because tillage, harvesting, and marketing activities are less intense. Yet the economic value of woodlands to farmers is not negligible. Table 6 above reported USDA's estimate that sales of forest products from Maryland farms amounted to $33 million in 2000. This is only 5 percent of the value of annual crops sold, but for those farms that sell timber or other forest products, the sale occurs only a few times or perhaps even only once during a farmer's income-earning years, and so can be very important in those years. Even so, forest resources are best viewed not as a constraint on farming activities but rather as a supplementary income source analogous to a farmer's earnings from off-farm activities.

Capital resources. The stock of equipment and structures on farms is created rather than a fixed endowment, and so is not typically reviewed as a fundamental constraint. However, credit

or other sources of funds are necessary for investment and maintenance of the capital stock in agriculture. A possible source of concern is the estimate by USDA's Economic Research Service of a decline of 32 percent in Maryland's capital stock on farms between 1980 and 1996 (the last year estimates are available). This appears to be attributable to (a) a decline in perceived investment opportunities, (b) depreciation of the substantial one-time investments in equipment made during the commodity boom of the 1970s, and (c) efficiency gains under lower-tillage practices that require less capital.

The decline in capital does not appear to be the result of credit or financial constraints. Moreover, the decline in Maryland's farm capital stock, although substantial, is less than the decline in the U.S. as a whole over the 1980-1996 period (55 percent according to USDA's estimates).

Labor resources. While conversion of farmland to nonagricultural uses gets most attention as a constraint facing Maryland agriculture, the availability of an adequate and reliable farm labor force is also an issue. This is especially true in a growing suburban area where many nonfarm earning opportunities are available. As Figure 16 shows, since 1980 employment on farms has been declining more rapidly than farm numbers, with the farm labor force down by more than one-third since 1980.

Figure 16. Maryland Farms and Agricultural Employment, 1969-1999
Sources: U.S. Bureau of Economic Analysis, Regional Economic Information Series, 2001; Maryland Department of Agriculture, Maryland Agricultural Statistics Service, *Agriculture in Maryland*, various years

The data shown in Figure 16 include all labor used on farms, including that of the operator, unpaid labor by family members, and hired workers. As Figure 17 shows, the number of hired farm workers has declined more rapidly, with less than half the number currently than twenty years ago. Seven out of ten farm laborers in Maryland are seasonal, that is, work on the farm for fewer than 150 days during the year. Horticultural crops are the leading employer of agricultural labor, accounting for 23.6 percent of hired workers. Field crops (including tobacco, potatoes, hay) use

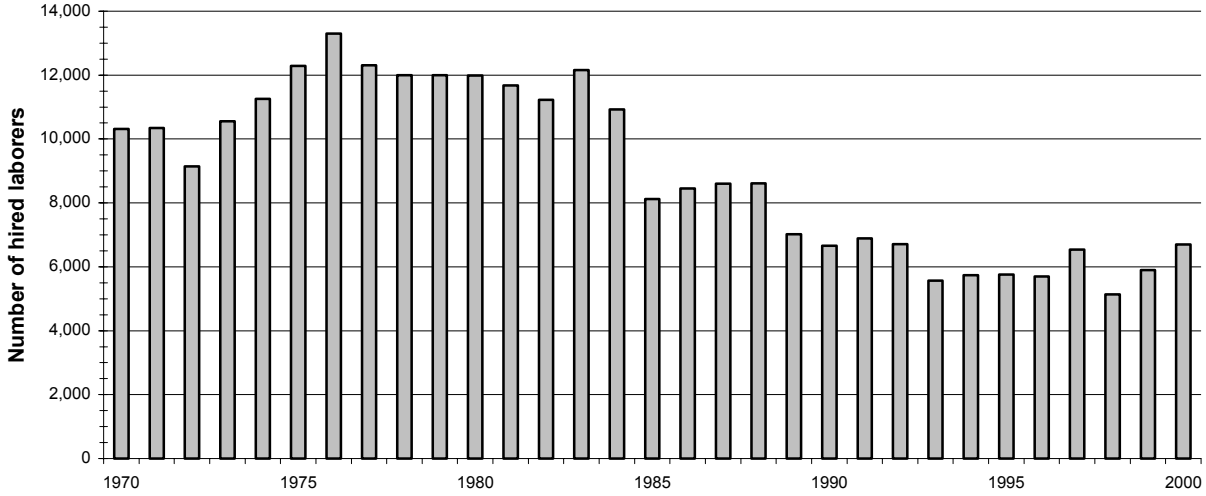

Figure 17. Hired Labor on Maryland Farms
Source: U.S. Bureau of Economic Analysis, Regional Economic Information Series, 2001

14.7 percent of the hired farm labor force, cash grains (including wheat, corn, soybeans, barley, oats) use 13.5 percent, dairy farms 11.5 percent, and poultry and eggs 11.3 percent of the total.

Hired farm laborers are among the lowest paid of all workers, but their earnings in Maryland have been increasing relative to nonfarm workers, as Figure 18 shows. This trend raises a question of whether Maryland can remain competitive with other states in the production of labor-intensive commodities. Although Maryland farm wages have risen, this has occurred in other states too. In 1999 the U.S. average wage rate paid to hired farm workers was estimated to

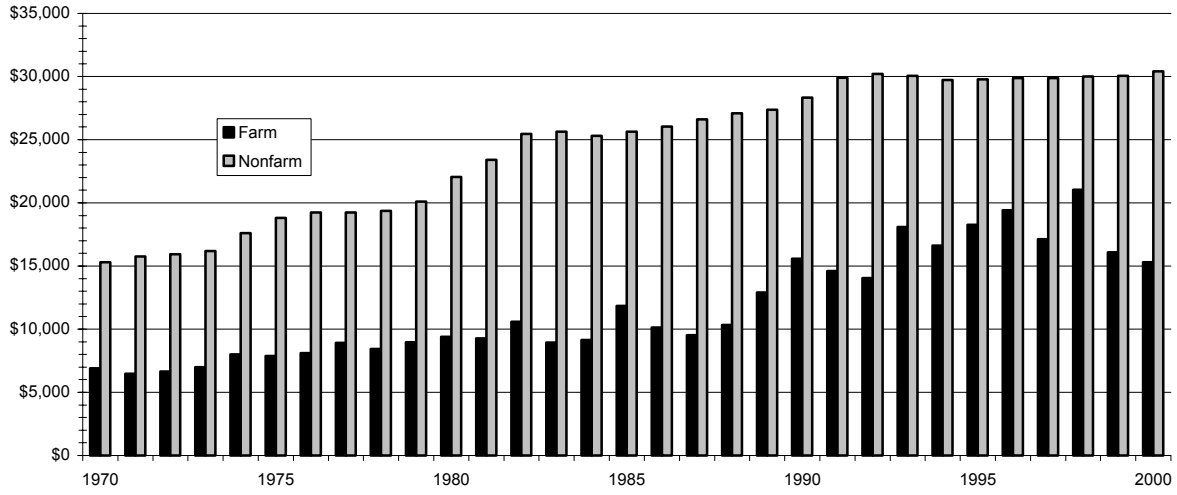

Figure 18. Average Earnings of Hired Farm and Nonfarm Workers in Maryland
Source: U.S. Department of Commerce, Bureau of Economic Analysis
Note: Average wages are adjusted for inflation to 1996 dollars using chained 1996 dollars.

be $7.77 per hour, while in Maryland the estimate was $7.63. In 2000 the estimate was $8.10 for the U.S. and $8.51 for Maryland. Because USDA's state-level wage rates are based on a relatively small sample, it is not certain that Maryland's farm wages were really slightly below the U.S. average in 1999 and above in 2000 – the likely situation is that because of the mobility of workers there now exists a national market in farmworker services, and Maryland employers must compete in that market.

Agriculture-Related Sectors

The resource base for agriculture is part of the "upstream" economy, whose products and services feed into agriculture. In addition to the primary inputs of land and labor, agriculture depends on supplies of purchased inputs and services from upstream industries. These industries in turn depend on agriculture as the source of their employment and demand for their output. Table 6 above itemized spending of $284 million by Maryland farmers on fertilizers, energy, pesticides, machinery repair, and other services in 2000. There are no estimates available of how much of this spending goes to suppliers in Maryland rather than in other states, but the Maryland share is undoubtedly large.

Other sectors are closely connected to production agriculture through agricultural services, "downstream" processing, and marketing necessary to bring agricultural commodities to the consumer. The agricultural economy in a broader sense is defined to include producer-linked agribusiness dependent upon production agriculture. The issue of how far to go in this inclusion – that is, what sectors are included in an "expanded agriculture" – has been vigorously debated. USDA has two working definitions of an expanded agriculture. The first, called the "food and fiber sector" (FFS), is a final demand concept, defined as consisting of "expenditures for food, clothing, shoes, tobacco products, flowers, seeds, and potted plants; net agricultural and textile exports; the value of farm inventory change; and the value of changes in off-farm private and government stocks of farm commodities (Leones, Schulter, and Goldman, 1994). The second concept used by USDA is the "farm and farm-related" (FFR) industry, defined as "having 50 percent or more of their national work force employed in providing goods and services to satisfy domestic final demand and agricultural products" (Majchrowicz and Salsgiver, 1993).[15]

In this study, Maryland's expanded agriculture is defined to include production agriculture and producer-related agribusiness, which includes agricultural services, food processing, wholesale farm-products raw materials, and agribusiness associations. The inclusion criterion used for a producer-linked agribusiness is one that would unlikely exist or be significantly reduced if there was not a production agriculture sector in the state. This definition explicitly excludes agribusiness sectors such as Maryland's wholesale and retail grocers and eating and

[15] In addition to these national definitions, a number of states have used alternative definitions of an expanded agriculture. A recent survey of over thirty state reports on agriculture's economic contribution found wide latitude in the definition of agriculture (Hornbrook and Hoag, 1997). In general, definitions were broad vertically, spanning from input suppliers to wholesalers and retailers, as well as broad horizontally, including many non-traditional sectors such as horsetracks and lawn and garden supplies. Clearly, the wide latitude in defining agriculture introduces problems with consistency and objectivity.

drinking establishments since these businesses do not depend on supplies or raw material from Maryland agriculture in the way that milk, poultry, or vegetable processing plants do.

On-farm production of crops and livestock provides less than a third of all agriculture-related jobs in Maryland. In 2000, production agriculture employed 18,400 farm proprietors and wage and salary workers, while farm-related upstream and downstream employment was 45,030, including workers in agricultural chemicals, feed, seed, and farm machinery; agricultural services like farm management, horticultural services, farm credit, storage and transportation, farm machinery and equipment repair, and marketing; and agricultural and food processors.

The largest farm-related employment sector is food processing – some 325 companies that pack or process all types of farm products, from beef and poultry to flour milling and vegetable processing. In 2000, this sector employed over 21,200 workers, paying $787 million in wages and salaries. Other agricultural-related manufacturers, including agricultural chemicals as well as farm and garden machinery and equipment manufacturers, are small employers in Maryland, with combined employment amounting to 630 workers, with $34.8 million in wages and salaries. The broader agricultural inputs and services sector includes suppliers of fertilizers, feed, seed, livestock (e.g., hatcheries), farm machinery and equipment, fuel, and electricity. Services such as repair and maintenance, crop services, veterinary and other animal services, farm labor contractors and farm management services, horticultural services, farm product storage, transportation, farm credit and insurance services, and agricultural and commodity associations employed about 23,200 workers, with $921 million in wages and salaries. This sector, especially its services component, has experienced remarkable growth over the last eight years (Figure 19).

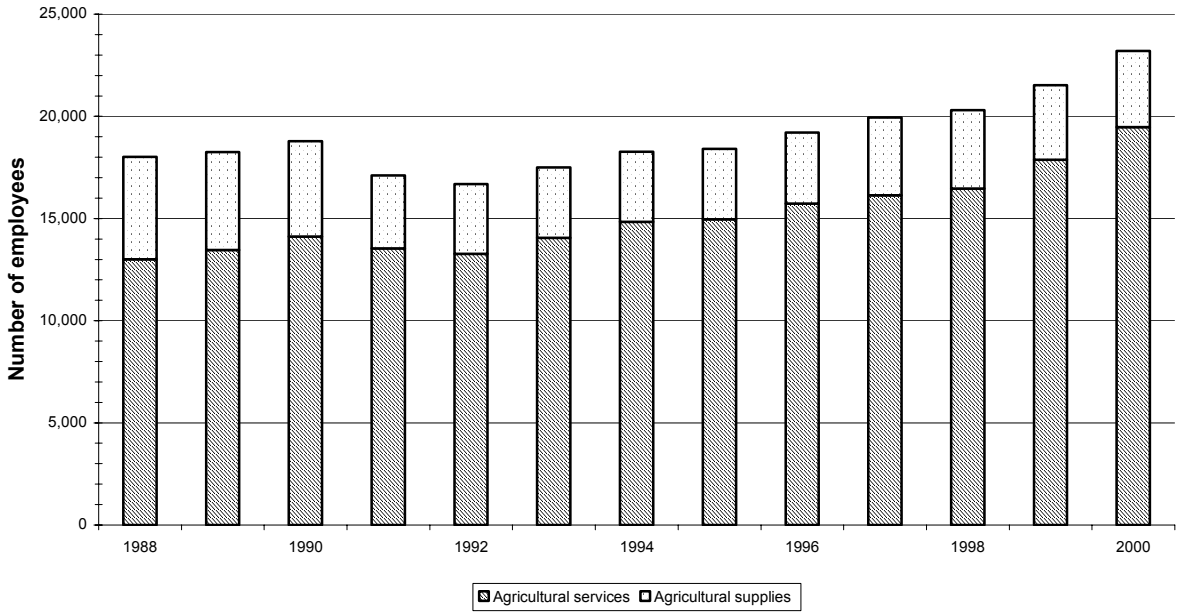

Figure 19. Employment in Maryland Agricultural Supplies and Services, 1988-2000
Sources: Maryland Department of Labor, Licensing and Regulation, Division of Labor and Industry; U.S. Bureau of Labor Statistics, Covered Employment and Wages

USDA's alternative definition of farm and farm-related sectors includes the businesses just listed plus forestry and fishing, as well as wholesale and retail trade of agricultural products. Under this definition, Maryland had an estimated 350,618 workers in the agriculture-related industry in 1997, about 16 percent of the state's total workforce (see Majchrowicz, 2001).

The strength of upstream and downstream linkages between agriculture and other sectors of Maryland's economy is the basis for determining how much the state stands to gain from an expansion of the agricultural economy – and conversely, the potential statewide losses should Maryland agriculture decline. In this study, economic impacts are calculated using coefficients from an input-output model. An input-output model accounts for all the transactions between different industries. Such transactions include the purchases and sales of industries to each other, sales of industries to final consumers and governments, and purchases of labor and other resources from households.

IMPLAN, originally developed by the U.S. Forest Service and widely used by government and university analysts, is the input-output model utilized in this analysis. The IMPLAN model is based on inter-industry relationships for the United States' national economy but adjusted to a Maryland state model based on state import-export relationships. We assume that the coefficients of inter-industry linkage in Maryland are similar to the national industry, for example that each additional ton of corn produced has the same effect on fertilizer use, in an upstream linkage, and the same impact on the feed milling industry, in a downstream impact.

The economic impact of agriculture, or any other sector for that matter, is not limited to its own activities. Every dollar generated or person employed has the potential to stimulate more income and more jobs. This increased earnings or employment is referred to as the "multiplier effect." For instance, if there is a new food processor, that plant will make purchases (e.g., raw agricultural commodities, packing materials, energy) within the region, as well as hire workers, who in turn spend a portion of their wages and salaries on food, housing, entertainment, transportation, and so forth, which in turn will be spent by workers in these areas and so on throughout the economy. A key step in estimating the economic impact of agriculture is therefore the estimated value of economic multipliers for the industry. These multipliers indicate changes in various aggregate economic variables for each dollar change in the value of industry output.

IMPLAN multipliers for the state's aggregate output, employment, and workers' incomes for the main agricultural products, taking into account effects in both upstream and downstream industries, are shown in Table 11. Each additional dollar of agricultural output adds roughly $1.5 to the state's output and between $2 and $3 to the state's total value added (which includes upward relative price effects as well as output effects). The variations from one commodity to another are not large, because each farm product feeds into others. For example, hay and pasture themselves are relatively low-valued activities, but that output feeds into dairy and horse enterprises which have larger impacts.

The mix of commodities that Maryland produces is determined not only by the land, climate, and other resource availability constraints that we have been discussing, but also by commodity demands. The leading commodities in 2000 are listed in Table 12. Broilers are dominant by far.

Table 11. Economic Multipliers in Maryland Agriculture

Agricultural sector	Output	Labor Income	Total Value-added	Employment
Dairy farm products	1.45	1.77	2.15	2.05
Poultry and eggs	1.37	2.65	2.87	2.30
Cattle feedlots	1.51	2.15	2.61	2.22
Sheep and lambs	1.56	2.16	2.68	1.17
Hogs and pigs	1.46	2.63	2.95	1.42
Food grains	1.68	3.01	2.66	1.33
Feed grains	1.58	2.81	2.34	1.52
Hay and pasture	1.58	2.23	2.14	1.15
Grass seeds	1.73	3.05	2.36	1.08
Tobacco	1.59	1.95	2.13	1.19
Fruits	1.62	1.76	2.02	1.49
Vegetables	1.64	2.13	2.23	2.08
Oil-bearing crops	1.66	2.45	2.33	1.42
Forest products	1.59	3.09	2.13	1.52
Nursery and greenhouse products	1.65	1.99	2.02	1.68

Source: Robert Chase

Table 12. Maryland's Leading Commodities by Cash Receipts, 2000

Commodity	Cash receipts ($ millions)	Share of Total Receipts
Broilers	$462.3	31%
Nursery products	$211.5	18%
Dairy products	$181.0	12%
Soybeans	$92.2	7%
Corn for grain	$85.0	6%
Vegetables	$80.5	6%
Cattle and calves	$70.6	5%
Miscellaneous livestock and products	$67.9	5%
Floriculture	$57.8	4%
Eggs	$42.1	3%

Source: Maryland Agricultural Statistics Service, 2001

If all grain and soybeans were aggregated, their value would be $214 million, placing the grain-oilseed production complex in second place. Nursery and greenhouse products are moving up fast. Some details of this expansion are shown in Table 13. Greenhouse and nursery products

Table 13. Greenhouse and Nursery Products, Value of Maryland Production

Year	Total Floriculture Crops	Other Environmental Crops	Total Nursery and Greenhouse
1984	12.8	79.0	91.8
1985	22.0	91.0	113.0
1986	22.6	116.0	138.6
1987	39.5	140.0	179.5
1988	31.7	140.0	171.7
1989	24.5	150.0	174.5
1990	21.6	156.0	177.6
1991	22.7	167.0	189.7
1992	26.5	178.0	204.5
1993	30.2	195.0	225.2
1994	28.1	193.5	221.6
1995	28.8	199.0	227.8
1996	27.9	199.5	227.4
1997	33.9	201.0	234.9
1998	52.3	203.5	255.8
1999	50.2	206.0	256.2
2000	57.8	211.5	269.4

Source: Maryland Agriculture Statistics Service

are increasing throughout the United States, but the industry is expanding especially rapidly in Maryland.

Overall results in terms of Maryland's product intensity relative to the United States as a whole are shown in Table 14. These product intensities are an indicator of the state's apparent comparative advantage in commodity production. The index is calculated as the share of each commodity in Maryland divided by the share in the U.S. Thus, the highest value – 4.4 for broilers – indicates that the share of broilers in Maryland's commodity receipts (31 percent) was 4.4 times the share of broilers in cash receipts of all U.S. farms (7 percent). Table 14 indicates that Maryland's product intensities have changed over time to indicate decreasing comparative advantage in tobacco, hogs, vegetables, fruits, dairy, and even broilers (notwithstanding Maryland's continuing high standing in broilers). On the other hand, product intensities are increasing in nursery/greenhouse, wheat, and barley production.

Maryland's product intensities are indicators of specialization between states, whereby each state concentrates more on commodities in which it has the most comparative advantage (as opposed to each state trying to produce some of everything that will grow there). This tendency to specialization is apparent in the decline of fruit and vegetable production, where more is produced in the West and South and shipped to the Northeast for consumption.

Table 14. Agricultural Product Intensities (Relative to the United States) in Maryland

Agricultural commodity	1960	1970	1980	1990	2000
Livestock and products	1.206	1.158	1.417	1.151	1.120
Meat animals	0.387	0.291	0.327	0.273	0.190
Cattle and calves	0.422	0.297	0.285	0.247	0.228
Hogs	0.321	0.285	0.484	0.361	0.065
Dairy products	1.855	1.974	1.941	1.252	1.154
Poultry/eggs	2.966	3.690	5.247	3.752	3.152
Broilers	8.096	9.360	10.385	5.956	4.355
Chicken eggs	0.754	0.849	0.959	1.751	1.273
Miscellaneous livestock	0.573	0.860	2.441	2.341	2.193
Crops	0.740	0.778	0.605	0.832	0.873
Food grains	0.341	0.241	0.182	0.443	0.542
Wheat	0.367	0.282	0.208	0.511	0.654
Feed crops	0.808	1.074	0.779	0.748	0.744
Barley	0.720	0.643	0.705	1.124	1.306
Corn	1.121	1.508	0.926	0.817	0.741
Hay	0.565	0.425	0.399	0.625	0.843
Tobacco	2.096	1.945	1.756	0.823	0.858
Oil crops	0.935	0.480	0.591	1.004	0.874
Soybeans	1.132	0.544	0.643	1.144	0.966
Vegetables	1.230	0.927	0.678	0.918	0.666
Potatoes	na	0.154	0.292	0.143	0.523
Tomatoes	1.858	1.280	0.896	1.018	0.606
Fruits/nuts	0.389	0.403	0.302	0.131	0.131
Apples	1.449	1.713	1.854	0.515	0.349
Peaches	1.036	1.563	1.063	0.436	0.962
All other crops	0.957	1.064	0.985	1.818	2.050
Greenhouse & nursery	1.633	1.725	1.808	2.620	2.716

Source: USDA, Economic Research Service
Note: "na" means data not available

In addition there is increased specialization between farms within a state, as each farm concentrates more on commodities in which it has the most comparative advantage (as opposed to each farm trying to produce many different products). This tendency is also fostered by economies of size stemming from fixed costs of large-scale specialized equipment. Figure 20 illustrates this trend in Maryland by charting the decline in numbers of farms producing various

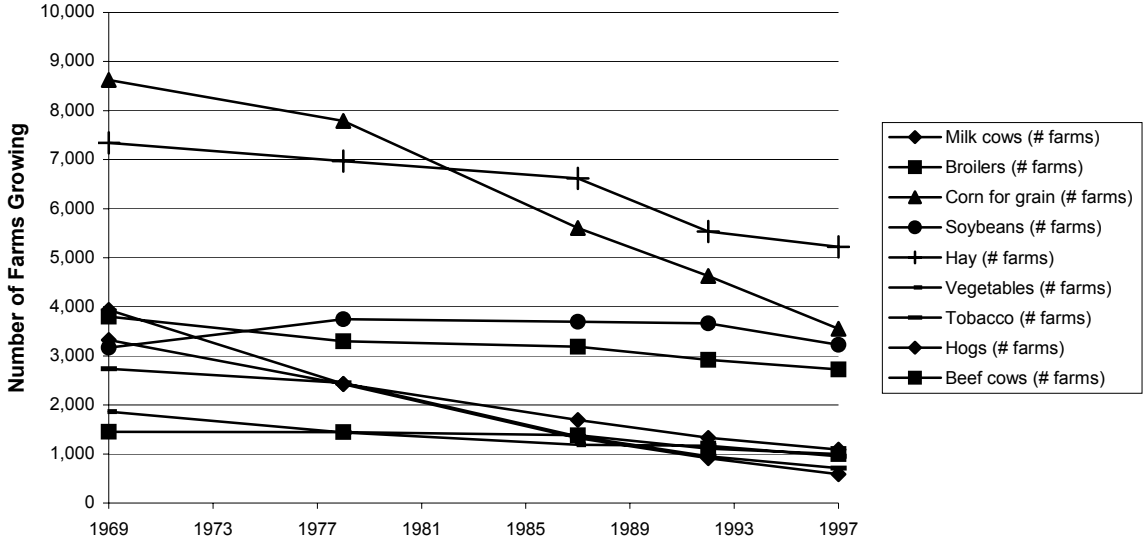

Figure 20. Maryland Farms Growing Selected Commodities
Source: Census of Agriculture

commodities. The number of farms having milk cows, for example, declined from 2,429 in 1978 to 1,091 in 1997, and the number of farms growing corn also declined by more than half during this same period, from 7,789 to 3,554. Overall the number of farms growing most commodities declined faster than the number of farms did. This just means that fewer commodities are grown per farm, i.e., more specialized farming. Taking the nine main commodities grown in Maryland, the average farm grew 2.5 of them in 1969, but 1.9 in 1997.

Along with increased specialization, changes in the economic organization of farms are as notable in Maryland as elsewhere. Some view with alarm a rise in corporate farming. However, in Maryland only one in 200 farms (0.5 percent) is owned by a corporation other than small family-held incorporated farms, and 85 percent of all farms, accounting for 69 percent of land in farms, are owned by a single family or individual (Table 15). The change in economic organization that has made a big difference is production contracting, especially in broilers, where that type of operation has become the overwhelming norm. Under such contracts, growers get access to cutting-edge technology and information, find it easier to borrow funds for investment in chicken houses, and have a largely guaranteed marketing outlet with predictable prices for the services the grower provides. But the grower loses autonomy and the opportunity to profit during unexpected high-price periods. Complaints have been reported of growers being exploited when it is time to renew contracts and their fixed investments in chicken houses have no profitable alternative use. But in the meetings, interviews, and questions asked around the state for this report, we found satisfaction with the broiler-growing system.

Table 15. Legal Organization of Farms in Maryland and United States, 1997

Maryland

	Individual or Family	Partnership	Corporation – Family-Held	Corporation – Other	Other	All Farms
Farms, percent	84.6%	8.2%	5.8%	0.5%	0.7%	100.0%
Average area, acres	145	339	414	135	382	178
Total area, percent	68.8%	15.6%	13.6%	0.4%	1.6%	100.0%

United States

	Individual or Family	Partnership	Corporation – Family-Held	Corporation – Other	Other	All Farms
Farms, percent	86.0%	8.9%	4.0%	0.4%	0.8%	100.0%
Average area, acres	356	881	1,571	1,507	4,378	487
Total area, percent	62.8%	16.0%	12.8%	1.3%	7.0%	100.0%

Source: USDA, National Agricultural Statistics Service

A more important issue in the economic organization of Maryland agriculture is the role of landowners who are not farm operators. The 1999 Agriculture Economics and Land Ownership Survey of USDA found 11,200 owners of agricultural land who were not farm operators. Nonfarm operators indeed own more of Maryland's farmland than farm operators do. The USDA Survey estimates non-operators own 57 percent of Maryland's farmland compared, for example, to 45 percent in Virginia, 36 percent in Pennsylvania, 50 percent in the Corn Belt states, and 42 percent for the United States as a whole.

The heavy reliance of farm operators on rented land creates management problems and, at times, divergences of interest between landlord and tenant.[16] Tensions have arisen, for example, when landlords enroll formerly rented cropland in conservation programs, and under the increasingly complicated provisions of farm commodity program regulations that tie benefits to land but make payments primarily to operators. And, non-operator landlords are likely to be particularly susceptible to pressures to convert farmland to development.

[16] Some farm land is rented from one farm operator to another. In Maryland this is relatively minor, amounting to 80,000 acres in 1999 according to USDA's estimate, or 5 percent of all rented land.

OUTLOOK: KEY FACTORS IN THE FUTURE OF AGRICULTURE

The rather complicated story of current trends in Maryland agriculture can be summarized in terms of some problematical elements of the situation:

1. Farmland continues to be lost to development – but at a diminishing rate in recent years; and moreover, if we exclude the rapidly urbanizing counties of the Baltimore-Washington metropolitan area, the loss of farmland is no worse than elsewhere in the Eastern United States and only slightly worse than the Midwest.

2. Commercial agriculture is under increasing economic pressure, with low returns to investment. The statewide average data are skewed by the aggregate of larger commercial farms with smaller part-time operations. As discussed earlier, the majority of the almost 80 percent of Maryland farms with sales of less than $100,000 have negative net cash income (expenses greater than receipts). But even the larger farms on average earn rates of return that are quite low – 4 to 6 percent on invested capital as implied by USDA data. Loss of Maryland's ability to compete in hogs, vegetables, and fruits in earlier decades is now being felt in dairy and even broilers to some extent. But at the same time, the average financial position of Maryland's farms is strong, stronger than the average U.S. farm, with a lower incidence of bankruptcy and higher net worth of farms.

3. The increasing average age of farmers, both in Maryland and the United States as a whole, raises questions about the future of farming (Figure 21). Young farmers are increasingly scarce, even more so in Maryland than across the country: Only 3.2 percent of Maryland's farm operators were under the age of 35 in 1997. The elements of Maryland's urbanizing economy that help existing farmers financially by keeping land values high make it difficult and in some cases impossible to justify long-term investment in land and fixed capital for agricultural purposes. But at the same time, new entrants in farming and new investments by existing farmers are occurring. Competitive opportunities are opening up in specialized small grains and high-value nursery and other labor-intensive products.

4. Maryland's farms are small relative to the average U.S. farm and are not growing as fast in acreage, suggesting difficulties keeping up with Midwestern scale economies. But Maryland's operators of small farms are finding ways of keeping the enterprises going by using off-farm income opportunities to bolster family labor earnings, and small acreages and less time-intensive cropping with more farms focusing on providing recreational services through keeping horses or other direct sales of products and services to suburban buyers.

5. Farming is under pressure because of environmental issues. Agriculture has been perceived as being a contributor to environmental problems, most importantly as a source of nitrogen and phosphorus runoff that is held responsible for declines in water quality in the Chesapeake Bay and its tributaries. Beyond Maryland's Water Quality Improvement Act of 1998, whose implementing regulations are now being introduced, prospective as well as existing regulations of farm practices, land use, hiring and management of workers, and quality/safety regulation involved in marketing perishable commodities are all adding to a widespread feeling

Figure 21. Farm Operators' Average Age
Source: Census of Agriculture

in the agricultural community that farms and farmers are not appreciated or respected as they once were. This together with the low economic returns that characterize typical farm operations engenders a pessimism that could hasten the decline of the state's agriculture.

6. Despite these problems and perceptions, the nonfarm public generally sees agriculture in a favorable light. State government actions have been supportive more often than not. Maryland's rural landscape of mixed farms and forested area is highly attractive and is viewed as a prime asset by the public. The state and many local jurisdictions have reacted to loss of farms to development by enacting programs to preserve land in farming. However, these policies are not sufficient to guarantee an improved economic situation for traditional, commercially based agriculture. The nonfarm public may be equally happy to see 300 acres devoted to several small recreational horse farms as to a working dairy farm; but many in agriculture would see the conversion from the latter to the former as substantial social and economic loss.

7. Agriculture's contributions to the state's economy are not declining in real value (value of output deflated to compensate for changes in the general price level) over time, even though the share of the state's economic activity accounted for by agriculture is declining in Maryland as in other states because non-agricultural sectors are growing faster. The risks to the state's economy arise from the possibility that decreases in farms and farm acreage may over the next 20 years go so far as to seriously impair the economic health of nonmetropolitan areas of the state, notably on the Eastern Shore and in Western Maryland. For example, if the grain-broiler economy of the Shore begins to decline, might that generate an accelerating downward economic cycle as the land or production base falls below a critical level needed to sustain the industry at an efficient scale?

8. Some of the positive side of the picture outlined above derives from findings that, despite the pressures of urbanization, the situation and trends in Maryland farming are not much different from conditions in U.S. agriculture generally. Disadvantages in some respects are

offset by advantages in others. However, nationwide market conditions have serious weaknesses. Commodity prices have been at historical lows for the last four years. The economic consequences for producers of the main crops have been blunted by federal commodity programs that are spending over $20 billion in payments to growers. But this is not a situation to inspire the confidence needed for long-term investment in agriculture. That may not matter so much in parts of the country where alternative uses of farmland are few and unrewarding; but in much of Maryland, alternative uses are many and rewarding.

Implications for the Future

This section pulls together the elements of the current situation and trends from the preceding sections that in our judgment are most important for the future, and adds further information and analysis that bears on the outlook. In this process we draw on the explanatory factors that surfaced in the preceding review of data as well as interviews and studies carried out on the agricultural economy of other states and the U.S. as a whole. For this purpose the discussion is reorganized to consider first national and then state-level markets, followed by discussion of land use, environmental, and other factors. The issues are:

- weak markets and declining prices for traditional commodities
- marketing constraints and opportunities
- development pressures causing land conversion to nonfarm uses
- environmental concerns and regulation
- labor constraints
- other factors hindering Maryland's comparative advantage in agriculture

Federal commodity support programs and related policy issues are then covered in a separate section of Policy Issues and Alternatives.

National Commodity Markets

The main causes of recent low commodity prices nationwide appear to be weak international markets – beginning in 1997 the Asia Crisis, then the failure of China to emerge as a big grain importer as had been predicted and of Russia to maintain poultry meat imports, expanding production in competing exporting countries, and the generally strong dollar that has made U.S. products significantly more expensive (less competitive) almost everywhere. Although milk prices made a strong rebound in 2001, they fell sharply again later in the year, and their fluctuation and periods of extreme weakness in recent years do not encourage confidence in future profitability in dairy.

The consequences for net income, at least for producers of major crops, have been cushioned by a huge expansion of government payments for grain and soybeans (loan deficiency payments, "production flexibility contract" payments under the FAIR Act of 1996, and emergency market loss assistance payments that have doubled the FAIR Act payments in each of the last three years). Payments to Maryland residents totaled $34 million for the 1998 crops, $62 million for

the 1999 crops, and $89 million for 2000. An additional positive factor for Maryland farmers was generally outstanding yields in 2000 and 2001, after three years of poor yields.

The question however is what the future will bring. The 2002 Farm Bill promises to maintain support for the major commodities at roughly current levels for the next six years. However, unless commodity markets strengthen, this support will at best only maintain current agricultural activity. The idea of agriculture as a sector of the economy that has to rely on government support to survive will not provide a convincing basis for long-term investment in agriculture. Using baseline projections of USDA, the Congressional Budget Office, and the Food and Agricultural Policy Institute, the most likely scenario for commodity markets over the next decade is a modest increase in real prices (that is, rises in farm-level prices that slightly exceed the rate of inflation). USDA's long-term baseline projections (USDA 2002) for the major grains forecast U.S. production of grains and soybeans up 14 percent in 2012 compared to 2002, while exports are projected to increase 24 percent over this 10-year period. This tightening of the supply-demand situation increases the projected average U.S. farm price of grains and soybeans by 8 percent in real terms. Since real costs of production are expected to fall, there would be a significant increase in returns from today's depressed levels. Declines in support through government payments would be expected to occur with higher prices, principally because there would no longer be loan deficiency payments. This would offset some of the income gains, but realizing more of farm income through market receipts rather than government payments would provide a better environment for farmers' investment.

But similar optimistic projections have not proved accurate in the past. In any case, the idea that a rising economic tide lifts all boats will not be sufficient to ensure a bright future for commercial agriculture in Maryland. We also have to consider the state's position relative to other states.

Maryland's Competitive Advantages

Recent changes in the mix of commodities produced in Maryland, and some reasons for those changes, were discussed earlier. For purposes of this study, we considered the comparative costs of producing a more detailed list of products, in order to cast more light on the prospects for future agricultural production. The calculations are based on budgets developed in the Department of Agricultural and Resource Economics at the University of Maryland, as well as other land grant universities. These budgets were updated to correspond to current economic conditions and agricultural practices. Details are reported in Annex III.

The budgets show positive results for some major crops and livestock enterprises, but also a disheartening number of losses. For specialized fruit and vegetable products, the budgets also generate very mixed results. Profit or loss depends on many specific assumptions, and many of these do not apply to a particular producer's situation. Individual producers have prospered by finding particular market niches or developing specialized methods of production suited to their own situation that return healthy profits. However, even if Maryland growers doubled their acreage of vegetables (54,000 acres in 2000), orchards (5,000 acres), greenhouse and nursery products (16,000 acres), and found such uses for the state's tobacco acreage (6,000 acres), the additional acreage would still use less than 7 percent of Maryland's 1.4 million cropland acres

(and we would risk significantly driving down the prices of many of the products whose acreage expanded).

For the foreseeable future the economic fate of enterprises which now occupy the bulk of Maryland's farmland turns on the situation for the traditional bulk commodities, most importantly corn and soybeans. While corn and soybeans look relatively favorable in terms of both the budgets above and farmers' choices to produce them, one can ask what the prospects are for Maryland to continue to be competitive in the future. Two issues are changes in the relative efficiency of production and in the relative demand for Maryland's crops as indicated by premiums or discounts over Midwestern production.

An indicator of overall production efficiency is the total factor productivity (TFP) index, which divides an index of farm output by an index of all input quantities used to produce that output. Obtaining more output from the same inputs over a sustained period is a remarkable achievement of science and technology coupled with an economic environment that rewards adoption of innovations – an achievement that has eluded most countries of the world for most of history. TFP indexes have been created at the state level by the Economic Research Service of USDA, but unfortunately extending only through 1996. Figure 22 shows that productivity index for Maryland, Virginia, Pennsylvania, and the U.S. as a whole. All of these TFP indexes are growing steadily despite short-term fluctuations – the basis for the continuing competitiveness of the United States in world agricultural commodity markets. Maryland's record roughly parallels that of the other states, but there is an evident slowdown in Maryland's TFP growth after 1985,

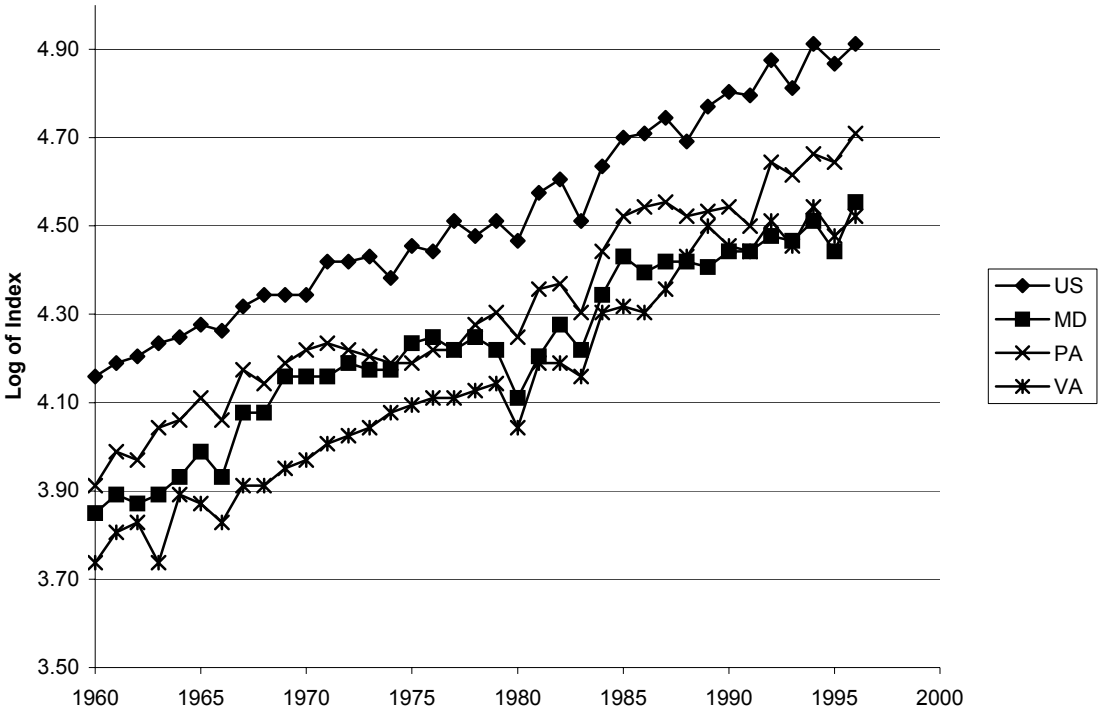

Figure 22. Total Factor Productivity Indexes
Source: USDA, ERS

relative to the two other states and the U.S. as a whole. The trend rate of growth is 2 percent annually for the U.S. as a whole, but only 1.8 percent for Maryland. This is a seemingly small difference, but over a period of 20 years it would mean that costs of production in Maryland would rise by about 5 percent relative to other states, enough to erode Maryland's competitiveness significantly.

Looking more specifically at corn and soybeans, we do not have total factor productivity measures, primarily because of the difficulty of allocating some farm inputs to production of a particular crop. However, growth of yield per acre may give an indication of differences in trends between states. Figures 23 and 24 show yield trends for corn and soybeans, respectively. Both corn and soybean yields show the same tendency as the TFP index to fall behind the U.S. average growth rate in the 1990s. Moreover, the same pattern exists for wheat yields. This is ominous for the future competitiveness of Maryland agriculture.

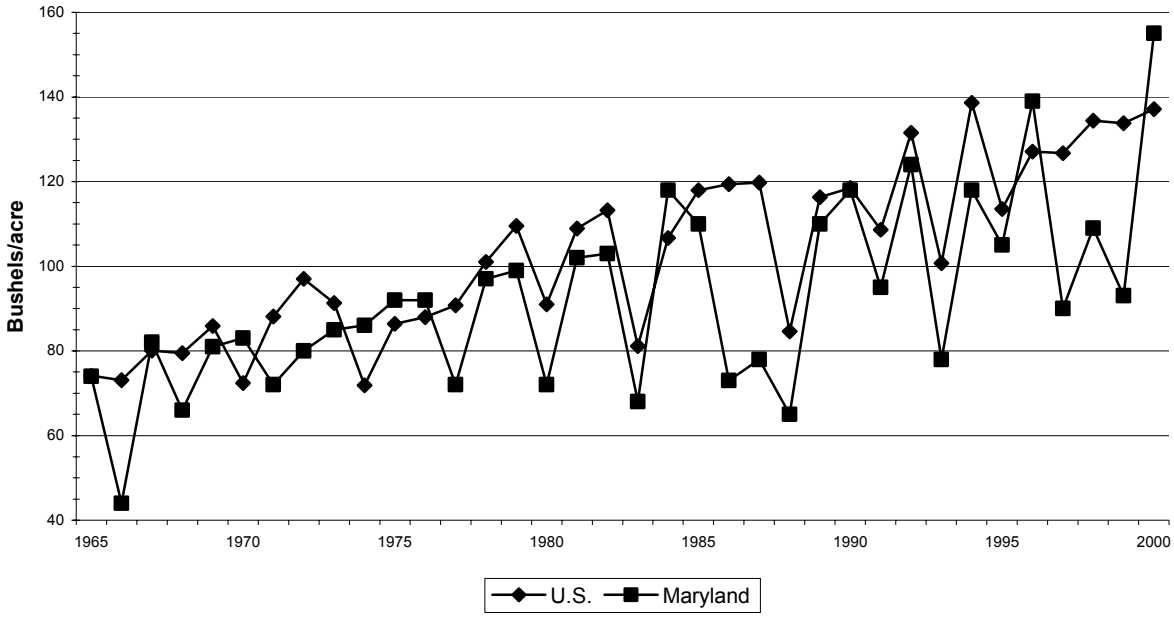

Figure 23. Corn Yields in Maryland and United States, 1965-2000
Source: USDA, NASS

Maryland producers could withstand gradual increases in costs of production relative to other states if at the same time the spread between Midwestern and Maryland commodity prices were increasing in favor of Maryland. Figure 25 shows this spread (season-average price received by farmers in Maryland minus the U.S. season-average price) over the last 20 years for corn and soybeans. The spreads vary a lot from year to year and prices average higher in Maryland. The corn spread is increasing over time, gradually, enough so that the trendline indicates a Maryland advantage of 36 cents per bushel in 2000 compared to 30 cents in 1980. But this is only a 2 percent gain in relative price and would not offset a 5 percent relative cost increase. And for

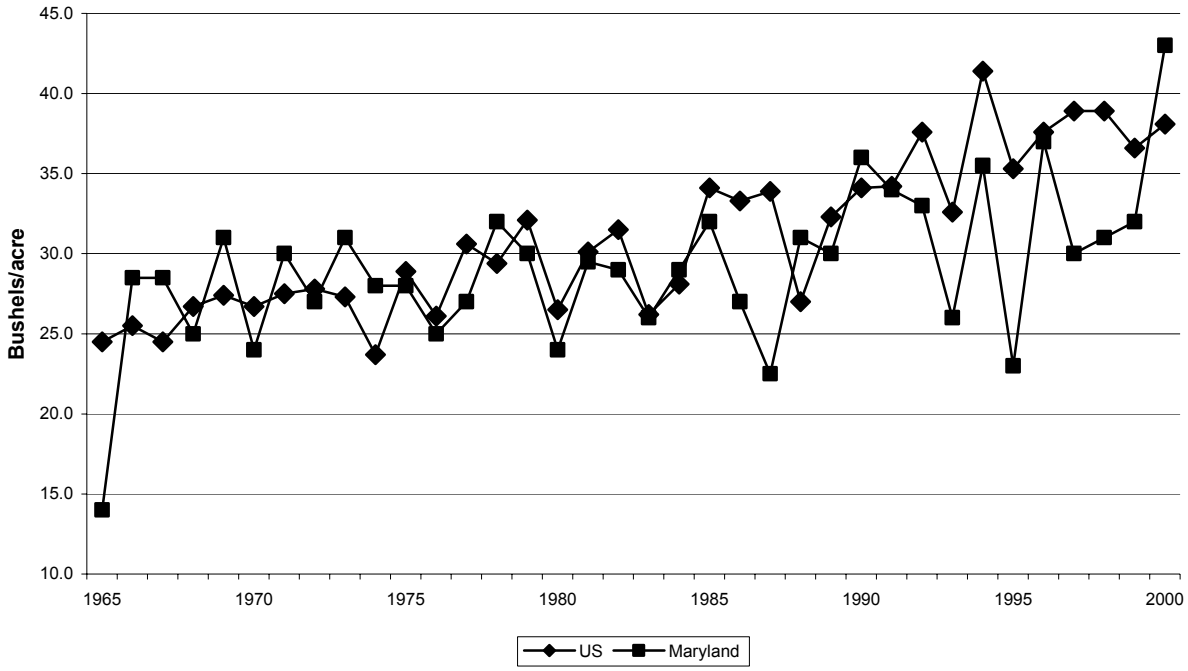

Figure 24. Soybean Yields in Maryland and United States, 1965-2000
Source: USDA, NASS

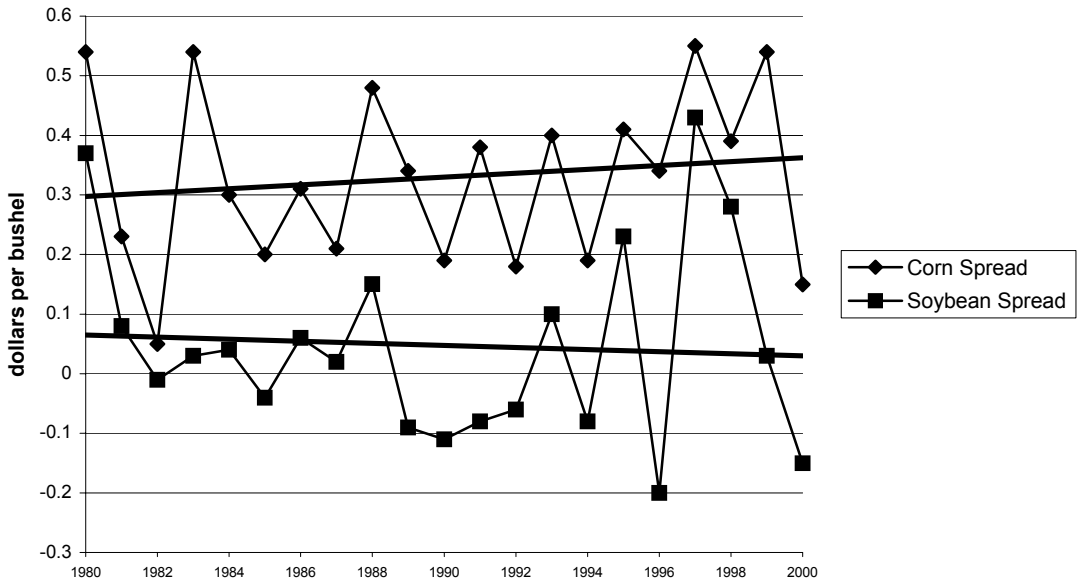

Figure 25. Grain Prices Received by Farmers, Maryland Minus U.S. Average
Source: USDA, NASS

soybeans the trend is toward a less favorable price spread for Maryland producers, although the trendline decrease is only about 3 cents per bushel over 20 years.

What evidence is there that relative yield and price trends are making an economic difference? The most sensitive indicator available is cash rents paid for cropland. Perhaps the most aggressive and bottom-line-sensitive actors in grain production are producers who rent land in order to provide a sufficient scale of operation to use their planting and harvesting equipment and time most productively. Their actions in land rental each year do more than any other factor to set cash rental rates. If their expected returns are squeezed by higher costs or lower price expectations, at least some renters will cut back their offers or reject asking rents they would otherwise have accepted. The effects for a one- or two-year change may not be substantial, but a trend over several years would be expected to cause cash rental rates in Maryland to change relative to U.S. average cash rental rates, or to rental rates in the Midwest.

Figure 26 shows relevant cash rental rates for Maryland, neighboring states, and Indiana and Iowa as representing the Midwest. These rates are surveyed annually by USDA, but have not been as consistently estimated over time as the basic crop production and price data have been; and no historical U.S. average has been estimated. Still, the data should indicate if Maryland's economic position in the U.S. crop production picture is drifting toward a less favorable position over time. In fact, Maryland cash rents since the mid-1980s have risen slightly less than in Iowa and Indiana. But the change is minor. Maryland's average cash rental rate was 49 percent of Iowa's in 1990, and 47 percent in 2001. This is within the range of random error of estimation of these rates (and going back to 1980, Maryland rents were only 40 percent of Iowa's).

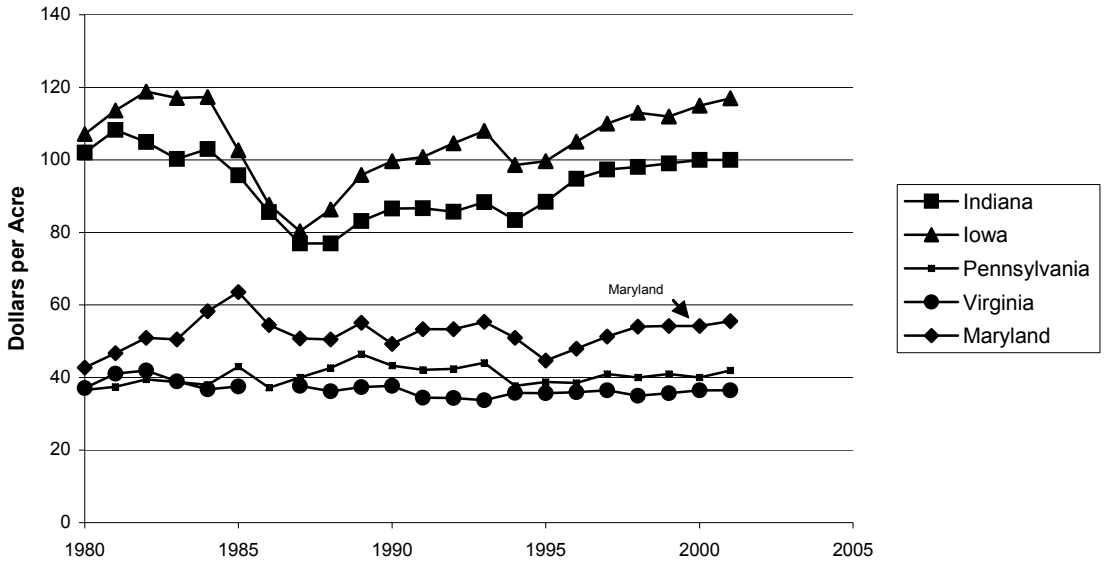

Figure 26. Cash Rental Rates for Cropland
Source: USDA, NASS

As national markets for the major field crops have tended to be in chronic surplus, with resulting low prices, and Maryland's competitive position within those markets has been seen as vulnerable, interest has shifted to vegetables, fruits, and specialty crops that may generate higher value added for farmers. The prospects indeed are favorable for many such crops. But the opportunities are so specific as to location and the skills of particular producers as to defy generalization.

As Table 16 indicates, farms that specialize in vegetables or greenhouse/nursery products (defined as farms with more than half of output in these commodities) do obtain higher net cash incomes on average than grain/oilseed farms. But vegetable and greenhouse/nursery farms also require significantly more operators on average than grain/oilseed farms.[17] So net income accounting for the cost of the operator's time would be more nearly equal across farm types.

Table 16. Maryland Farms by Crop Concentration, 1997

Product (NAICS category)[a]	Grains and Oilseeds	Vegetables and Melons	Greenhouse and Nursery
farms	2,701	504	821
acres per farm	371	155	54
sales per farm($)	77,420	79,167	145,792
labor expenses per farm ($)	4,953	15,081	40,728
net cash returns per farm ($)	10,998	18,810	49,294
government payments per farm	3,068	458	431

[a]NAICS is the North American Industrial Classification System. A farm falls in each category if more than half of the farm's output is included in the products listed.

Source: 1997 Census of Agriculture

Moreover, in considering opportunities for the future it is important to note that the aggregate acreages of vegetables and nursery/greenhouse crops remain small, and that only modest expansions of acreage could drive down commodity prices substantially. Figure 26a shows relevant data for 1997, and prior trends. Not only are acreages small, but for vegetables the acreage has been declining. This reflects mainly a trend toward reduced demand for processing vegetables. The acreage of greenhouse and nursery products has been expanding rapidly, from 7,700 acres in 1982 to 11,200 acres in 1992, to 15,400 acres in 1997. This indicates expanding demand and profitable opportunities.

Table 17 shows data for farms by type of livestock specialization, again from the 1997 Census. With respect to livestock products, dairy requires special attention as an area where Maryland has a long history but has seen declines in recent decades. Figure 27 shows the gradual reduction in milk production, which has reduced Maryland's share of U.S. output from 1.2 percent in 1980 to 0.8 percent in 2000, and which led to USDA removing Maryland from the list of 20 states that are surveyed monthly for production data. The number of dairy farms decreased much faster than production, with about 4,000 in 1969 falling to 961 in the 1997 Census.

[17] This is not true for large-scale grain-oilseed farms, but the data are dominated by smaller operations. Unfortunately, we do not have data cross-classified by sales class and NAICS category.

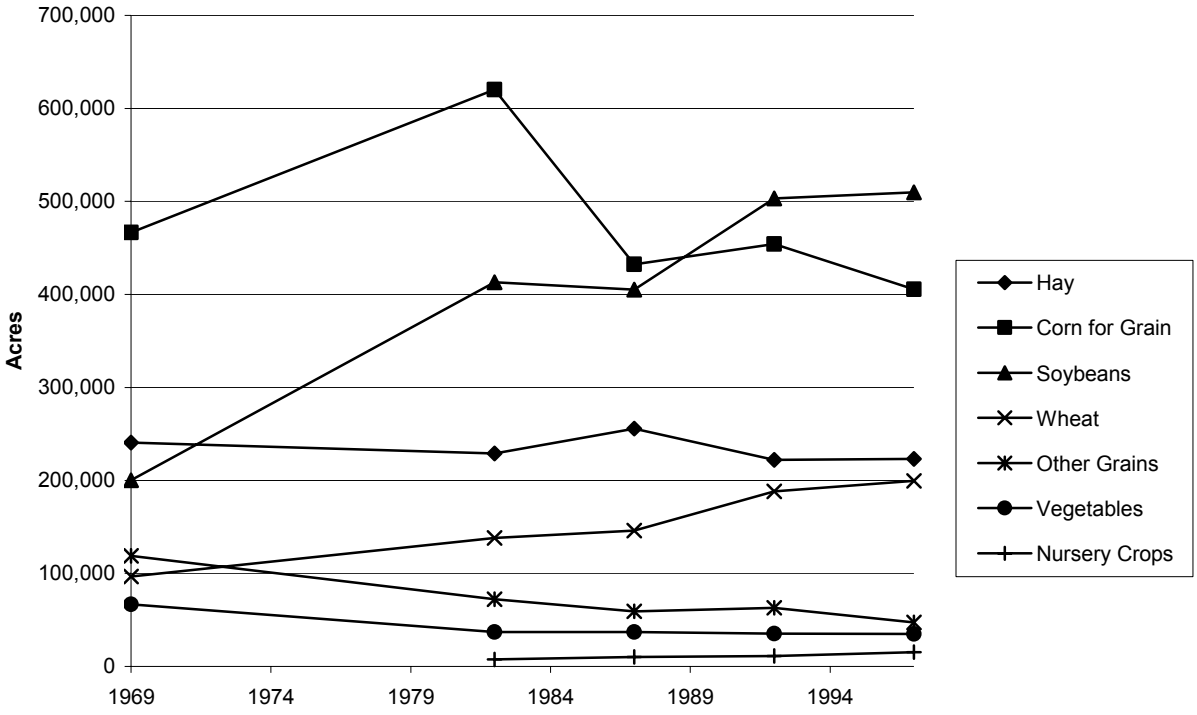

Figure 26a. Maryland Acreage Harvested by Crop
Source: Censuses of Agriculture

Table 17. Maryland Specialized Livestock Farms, 1997[a]

NAICS Category	Dairy	Poultry	Beef (not feedlots)	Hogs
farms	889	1,091	1,867	173
sales ($)	221,008	547,034	18,086	71,995
labor expenses ($)	20,286	13,801	1,047	4,503
net cash returns ($)	43,657	34,875	575	9,173
government payments ($)	2,448	1,534	238	763

[a]Specialized means more than half of farm output is commodity shown. All dollar figures are per farm.

Source: 1997 Census of Agriculture

Figure 27 shows Maryland milk selling at a slight premium to U.S. average milk over the whole period since 1980, with no apparent trend in the spread despite a number of controversial changes in the regional pricing of milk under the federal milk marketing order system during this

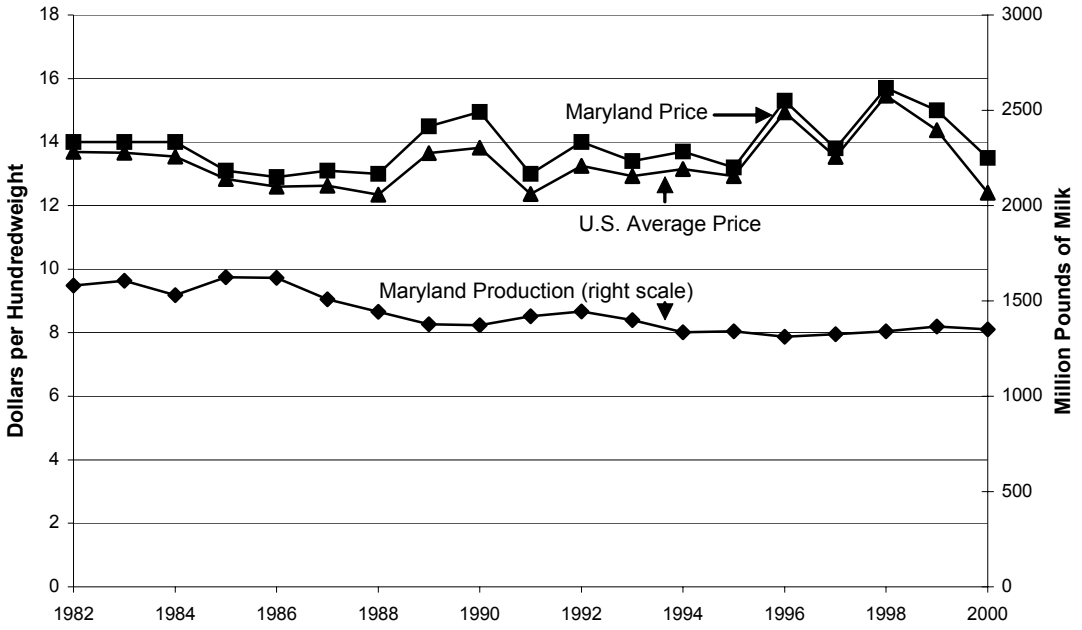

Figure 27. Maryland's Milk Production and Prices
Source: USDA, NASS

period. During 1995-2000 Maryland producers received on average 48 cents per hundredweight more than the average U.S. producer, with 2000 having the widest margin in recent years.

The data of Table 17 suggests dairy production generates reasonable returns as compared to alternatives. Why then are dairy farms disappearing at a rapid pace? The two main factors appear to be that milk prices have deteriorated since 1998, and that larger scale dairy production is taking over in Maryland as in other states.

The data as well as statements by producers suggest that the main causes of economic problems that are specific to Maryland in dairying involve land availability and land-use constraints resulting from a substantial part of the dairy industry being located in rapidly urbanizing areas. It should be noted however that a crop specifically relevant to livestock enterprises, hay, does not show the declines in Maryland's yields relative to the U.S. average that Figures 23 and 24 did for grains. Figure 28 shows corresponding trends for hay. Maryland's yields are higher and have been growing more rapidly than those of the U.S. as a whole.

It is nonetheless true that Maryland's share of U.S. milk production is declining, and may decline further. Is there a risk of decline to the extent that hog production, for example, has declined? One niche in dairy production that appears to be working well is low-concentrate, pasture and forage-intensive feeding of dairy cattle in Western Maryland. Annex III provides more detail on this approach. Good results are also reported for some large dairy enterprises of the feedlot type on both the Eastern and Western shore.

Hog production is a case where Maryland has slipped sharply, not only absolutely but also relative to nearby states. The value of hogs and pigs sold from Maryland farms declined from

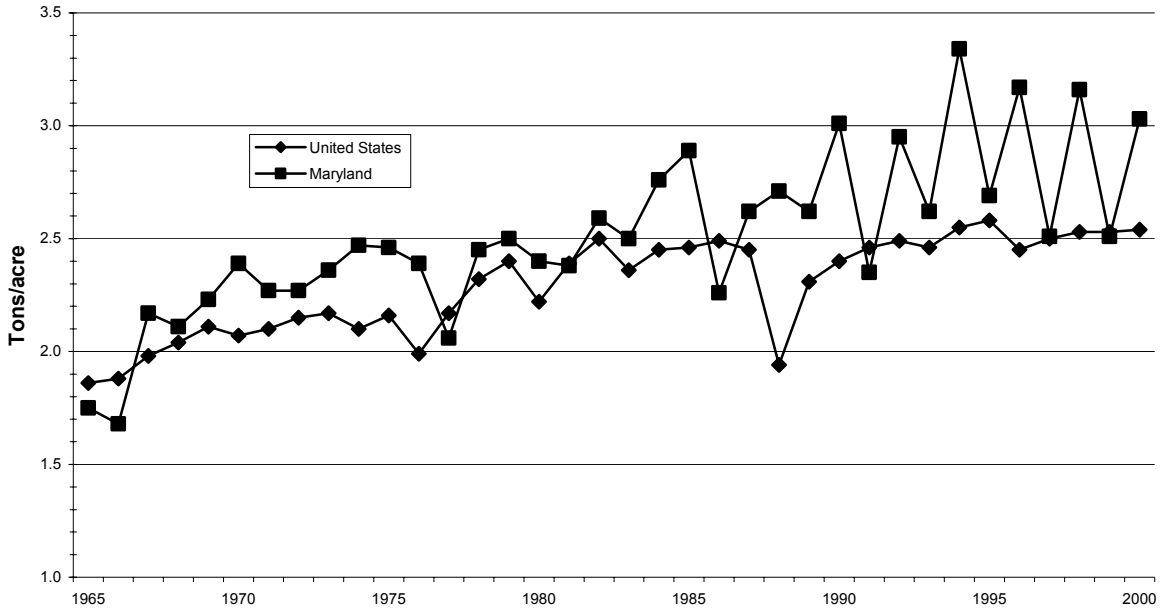

Figure 28. Hay Yields in Maryland and United States, 1965-2000
Source: USDA, NASS

$34 million in 1982 to $14 million in 1997, according to Census of Agriculture data, while Virginia's sales declined only slightly and Pennsylvania's increased from $165 million in 1982 to $235 million in 1997. A combination of factors are in play in reducing the viability of hog production in Maryland, but the key ones appear to be the hindrances suburban locations and environmental concerns place in the way of investment in the large confinement feeding facilities and contract production that are transforming the industry.

The most important commodity in generating sales and value added in Maryland agriculture is broilers. USDA estimates almost 1,000 farms growing broilers in 1997. While this is down from the almost 1,500 broiler growers of three decades earlier, the rate of decline of broiler growers is less than for producers of other commodities as Figure 20 showed. Notwithstanding the smaller number of growers, Maryland's broiler production has increased, as birds sold per farm more than doubled from 105,000 birds in 1969 to 258,000 in 1997. Broiler production generated 31 percent of Maryland agricultural cash receipts in 2000, far ahead of any other product. We do not present the budget information for broilers as for other products. Since they are grown almost exclusively under contract with processors or integrators, the economic situation is quite different for broiler production. The grower makes fewer production decisions, supplies fewer inputs, and is paid according to pre-arranged fees and bonuses rather than selling at market commodity prices, so budgets would not really be comparable to other commodities. These production arrangements have largely worked well for the broiler industry, and the Census data shown in Table 17 show reasonable returns for what is typically a part-time farming activity. Without the government support that dairy and the major crops have had, broiler production has been a helpful income-generating enterprise for both small, part-time operators and large-scale ones. The risks for the future involve environmental regulation and suburban

sprawl that threatens to generate too many neighbors who may not like large numbers of chicken houses in their surroundings (even if the chicken houses were there first), and land availability for feed crops that support broiler growing. Both of these issues will be discussed later.

Future Land Conversion to Nonagricultural Uses

Population growth and increases in median family income, combined with planning, educational, and transportation policies with unintended consequences, have led to a pace and pattern of development that raises concern for the future of agriculture. The average number of people per household has been decreasing as well, fueling this land consumption pattern. In the Washington, D.C., metropolitan area, the rate at which land is being consumed exceeds the population growth rate by almost 2.5 times (Chesapeake Bay Foundation, 2000). The resulting low-density development pattern, called "sprawl," creates fragmented housing and commercial development under which efficient use of land in agriculture and other resource activities becomes more difficult.

Maryland's 2001 population of 5.38 million is expected to grow to 6.0 million by 2020. Development associated with this growth is projected by the Maryland Department of Planning to consume 236,000 acres of farm and forestland in the next 18 years (103,000 converted from agricultural uses and 113,000 from forest lands). This rate of land conversion is somewhat less than has occurred over the past 20 years, and would leave 2.1 million acres in farms as compared to 2.2 million acres now (Figure 29).

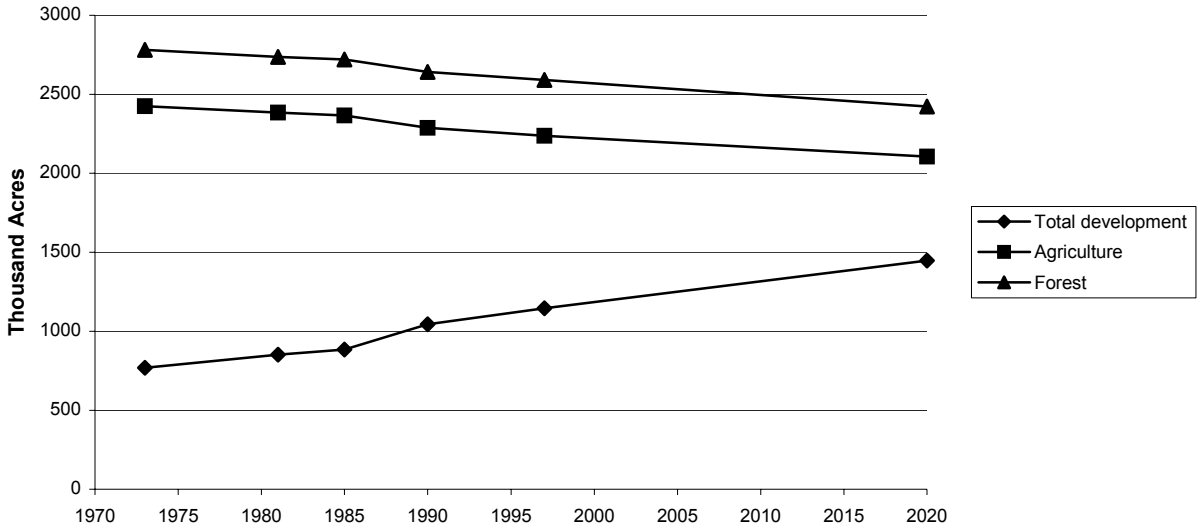

Figure 29. Projected Maryland Land Use in 2020
Source: Maryland Department of Planning

Thus, while a critical loss of farmland can be expected in some locations, as a statewide issue the day of reckoning on land use is not yet at hand. Still, serious problems are likely to be focused on vulnerable areas such as those surrounding the Chesapeake Bay. In 25 years, assuming growth in the Chesapeake watershed continues at the same rate experienced during the

1990s, it is estimated that more than 2.2 million acres of additional forests, wetlands, and farms will be converted to urbanized uses (Chesapeake Bay Foundation, 2000).[18]

A counterweight to economic pressure for development is provided by Maryland's agricultural land preservation programs. The state preservation program is permanently protecting 185,871 acres and is one of the most successful state programs in the country. Five of Maryland's counties rank in the top 12 nationwide for the largest number of preserved acres, ranging from 33 to 69 percent of these counties' agricultural land in a preserved status. Maryland has also led the nation in designing innovative programs and payment mechanisms, such as the state program's competitive bidding mechanism. Howard County's installment payment mechanism allows the county to leverage the available fund to preserve more acres now, before land values increase. This installment tool has been adopted in other Maryland counties, as well as around the country. The resources and attention that agricultural land preservation receives from both the state and county governments indicates their commitment to preserving agriculture in Maryland.

Although the programs have been successful in preserving acreage, there continues to be concerns about their contribution to a strong agricultural economy with prosperous and profitable farms. The policy issues are discussed further in the final section of this report.

The data reviewed earlier on farm numbers and land in farms indicate that the faster disappearance of farms and farmland in Maryland as compared to the U.S. as a whole are almost entirely a matter of Maryland being a highly urbanized state. It is not however a matter of the rate of overall population growth crowding out farming. Maryland's population is growing at almost exactly the rate of the U.S. as a whole, faster than Pennsylvania's, and slower than Virginia's. The loss of farmland is more specifically tied to the diffusion of residences and associated businesses through the formerly rural areas of metro-area counties, i.e., suburban sprawl as discussed above. Since 1980 the annual rate of decline of land in farms in the central metro counties has been 2.1 percent annually, while in the rest of the state the rate of decline is less than one percent. Outside these areas the density of population on nonagricultural land has not significantly increased since 1950 (Figure 30).

Stakeholders interviewed for this report, even on the nonmetropolitan Eastern Shore, almost uniformly saw suburban sprawl as the number 1 or 2 threat to the future of Maryland agriculture. This reflects the fact that only in Talbot and Worcester counties has the rate of decline of land in farms since 1980 been as slow as the 0.5 percent rate of the U.S. as a whole. Moreover, the prevailing concern is not just because of the extent of land converted to date, but also because the nonfarm residents who move into farming areas often tend to be inhospitable to the necessities of commercial agriculture. Moreover, as farms become separated by developments and fewer in number within any given area, product marketing and farm service supply become more difficult and costly. It is unlikely that commercial agriculture on a significant scale can long survive in rapidly growing suburban areas. Yet the rate of loss of farms and farmland in the state as a whole has so far proceeded at a sufficiently slow rate that the tide may be stemmed before further distant counties get to that situation.

[18] Note that this estimate refers to all the states in the Chesapeake watershed, not just Maryland.

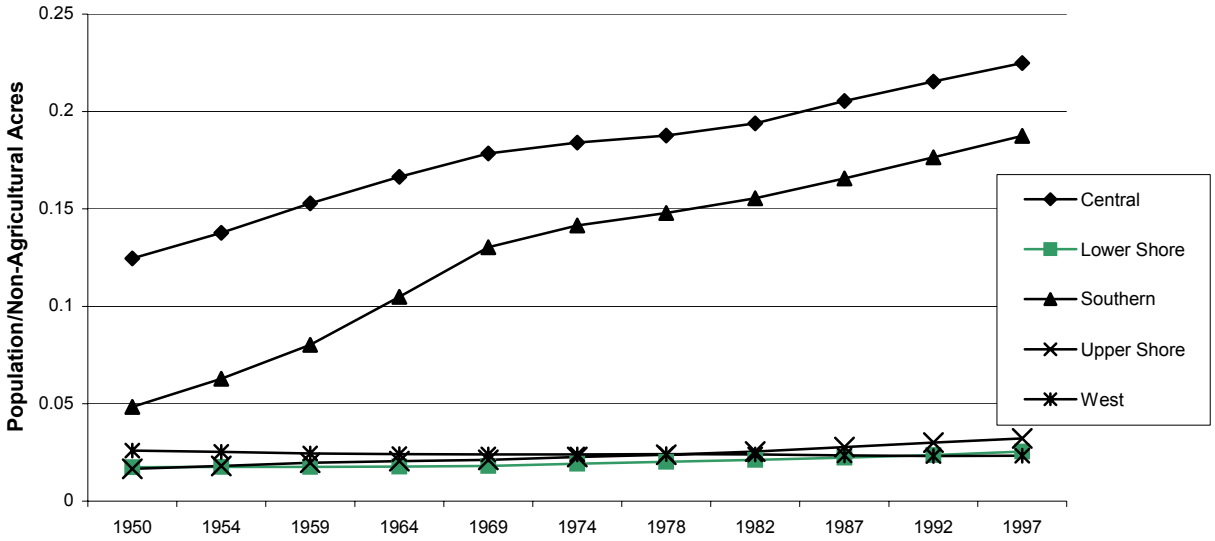

Figure 30. Population Density on Non-Agricultural Acres in Maryland
Source: U.S. Census of Population and Agriculture

Environmental Pressures

An issue that affects the future prospects of farming in every region of the state is agriculture's effect on the environment. The state of Maryland and the federal government are in the midst of implementing environmental regulations that could raise costs and reduce the competitiveness of Maryland farms. Further regulations on the horizon could exacerbate those effects. It should be noted that Maryland agriculture is not unique in facing new, potentially onerous forms of environmental regulation. More stringent federal regulations like restrictions on pesticides due to the Food Quality Protection Act and proposed tightening of regulations for animal feeding operations (see below) affect farmers nationwide. And many states aside from Maryland are extending environmental regulation to agriculture in ways not hitherto experienced.

Nevertheless, farmers in Maryland are more likely to feel the effects of environmental regulation than those in most other states because of the proximity of the Chesapeake Bay and its vulnerability to nutrient pollution, of which agriculture remains a major controllable source. The ecological health of the Bay is a central concern to the State. The Bay's commercial fishing, boating, and tourism are important both economically and to the State's self-image. Maryland has traditionally played a leading role in regional efforts to improve Bay water quality as well as making its own unilateral efforts. The state government's rapid response to the 1997 outbreak of pfiesteria in the Bay was consistent with its historical posture in this regard.

The Maryland Water Quality Improvement Act of 1998 (WQIA) aims to prevent future pfiesteria outbreaks as well as address longstanding problems of high concentrations of nitrogen

and phosphorus that impair Bay water quality. That Act broke with the State's tradition of reliance on voluntary adoption of erosion and runoff control practices in agriculture. Instead, it introduced regulatory requirements that farmers are legally required to follow. The Act attempts to limit nutrient emissions from agriculture, with special emphasis on animal production complexes (principally poultry and dairy) considered as a whole, targeting excess phosphorus in manure as the principal concern.

The poultry industry has received the most attention to date. Poultry litter has a phosphorus-to-nitrogen ratio much higher than crop uptake rates because poultry producers have traditionally supplemented diets with phosphorus to make up for the fact that birds are unable to digest some phosphorus in feed. Disposal of poultry litter has resulted in excessively high soil phosphorus concentrations in some locations. Attempting to treat this problem, WQIA imposes requirements on integrators, poultry growers, and crop producers. Integrators are required to use the enzyme phytase, which increases the digestible percentage of phosphorus in feed. This may lead to a reduction in phosphorus supplements. Poultry growers are required to dispose of manure in an acceptable manner and face new restrictions on disposal via land application. Crop producers are required to apply nutrients (chemical fertilizers as well as manures) in conformity with nutrient management plans prepared by certified personnel and dependent on measured soil nutrient concentrations. Each of these regulatory requirements imposes new costs.

The phytase requirement should not have a large effect on poultry integrators. Adding phytase (or another similar enzyme) to poultry feed requires reconfiguration of feed production procedures and retrofitting of feed lines at a cost of several hundred thousand dollars per plant for fixed equipment to retrofit feed lines. Amortized over the lifetime of the equipment, this additional cost amounts to a few tens of thousands of dollars annually per plant. The phytase itself must also be purchased. However, the use of phytase is expected to result in reductions in growers' outlays for supplemental phosphorus. The cost of phytase is roughly equal to the cost of supplemental phosphorus, so that the net impacts on variable costs are expected to be negligible.

WQIA imposes new limits on land application of manure as well as expanding enforcement efforts. Under WQIA, manure can only be applied to land in conformity with approved nutrient management plans written by certified personnel. The amount of manure and other nutrients that can be applied is limited by soil characteristics as measured by the Phosphorus Site Index (PSI), which takes into account soil nutrient status from soil tests, the location of the field, and similar factors. Manure cannot be applied to land whose PSI is excessively high; it can be applied in accordance with a phosphorus-based nutrient management plan on soils having intermediate PSI values; and it can be applied in accordance with a nitrogen-based nutrient management plan on soils with low PSI values.

These requirements (which affect crop producers as well as poultry growers) impose several kinds of costs, including plan preparation, transportation of manure, and costs of disposing of manure in alternative ways.

First, growers must pay for a nutrient management plan. Maryland Cooperative Extension (MCE) has been preparing plans without a charge for over a dozen years. Nutrient management

plans were in place for over 1 million acres at the time WQIA was passed, leaving another 1.2 million acres in need of initial plans (Maryland Cooperative Extension Service, 1997). Despite expansion of staffing, MCE has not had sufficient personnel to prepare plans for all that acreage in time to meet WQIA implementation deadlines. As a result, some plan preparation costs are paid by farmers using the private sector (consultants, growers, and other interested parties trained and certified by MCE). At present, the Maryland Department of Agriculture (MDA) provides for cost sharing up to 87.5 percent for preparation of nutrient management plans.

Nutrient management plans must be updated every three years. It is not clear how costly these updates will be. Work on computer software that could potentially lower the costs has recently been completed. However, new requirements could raise costs, while reductions in MCE staffing could shift a larger share of the cost onto farmers.

Second, it may be necessary to transport manure in order to apply it in compliance with nutrient management plan requirements. Land application of manure as fertilizer appears to be the least-cost method of disposal; in fact, the nutrients and organic matter in poultry litter make it a potentially valuable product that could be sold at a profit (to be used in place of commercial fertilizers) if transportation costs are not too high. It has been estimated that 36 percent of poultry growers apply the litter from their flocks to land they farm, either owned or rented, while the remaining 64 percent sell or give away that litter or pay someone to haul it away (Michel, 1996). WQIA requirements could change those practices, at least in the short run due to existing high soil phosphorus levels in some fields. In an analysis of the Eastern Shore using soil test data from the University of Maryland Soil Quality Laboratory, Parker (2000) has estimated that a maximum of about 150,000 tons of poultry litter would need to be exported from their counties of origin in the short run at a cost of about $410,000 annually.[19] In the long run, after soil phosphorus levels decline, Parker estimates that only about 50,000 tons of litter would need to be exported out of their counties of origin, at a negligible cost (or even a slight profit if litter can be sold for the value of its nutrients, less transportation and extra application costs).

While the net cost of WQIA on poultry and crop producers is not expected to be large, the distribution of costs between groups of growers will vary significantly. Poultry producers whose land has excessively high PSI levels are likely to experience substantial increases in cost due to the need to switch from poultry litter to chemical fertilizers and to high transportation costs for poultry litter. Crop producers whose land has low PSI levels may experience substantial reductions in cost as they switch from chemical fertilizers to poultry litter.

WQIA attempts to provide some relief for growers whose land has excessively high PSI levels, in the form of a 50 percent tax credit (up to a maximum of $4,500 per grower per year for up to 3 years) to help offset the costs of switching away from poultry litter.

The key to keeping these increased costs manageable will be the development of strong, well-functioning markets for manure. If poultry litter can be sold for the market equivalent of its nutrient value and its value as a soil amendment (adjusted for transportation and additional

[19] The University of Maryland Laboratory tests likely represent a proportionately high number of soils receiving animal manures, suggesting that these data overestimate the percentage of acres in each county with high phosphorus levels. Thus, the impacts of the WQIA are likely to be smaller.

application costs), it can be a profitable product. Well-functioning markets are necessary to ensure that litter can be sold for its actual value. WQIA contains provisions aimed at assisting the creation of a strong market for poultry litter. An animal manure matching service has been set up at the Maryland Department of Agriculture to facilitate the flow of information in the market (i.e., help willing buyers find willing sellers). This service allows buyers and sellers to call a toll free phone number and be matched with others in their area who are looking to sell or buy manure. WQIA also provides a 100 percent tax deduction for the cost of manure spreaders in their year of purchase to help offset the costs of converting from commercial fertilizer to poultry litter. Finally, WQIA provides a cost share of up to $20 per ton to help offset the costs of transporting poultry litter from poultry growing sites to alternative uses.

Since it became operational in the spring of 1999, the poultry litter transport pilot project has provided matching funds to transport almost 20,000 tons of poultry litter. The current rate of subsidized poultry litter being transported is approximately 2,000 tons per month. Nearly all of the poultry litter transported under this program has been out of the Eastern Shore area (average distance transported is 156 miles). The average amount paid by the program is $17.46 per ton (with a $20.00 per ton cap) with a ton per mile average of 11 cents. While this program has had a successful start, increased interest in transportation is expected when the nutrient management requirements of the WQIA become fully implemented.

The poultry litter transport pilot project has moved just over 5,000 tons of poultry litter across state lines. Currently, poultry litter shipped across state lines under the poultry litter transport pilot project must be used in compliance with the Maryland WQIA. The amount of land available out of Maryland will depend upon nutrient management regulations in our neighboring states.

Uses of poultry litter other than land application may also turn out to be economically attractive. For example, a joint venture between Perdue and AgriRecycle processes poultry litter into pellets that are marketed as a soil quality enhancer outside the state. Their plant in Seaford, Delaware, currently processes about 60,000 tons of poultry litter annually, is permitted to process 80,000 tons, and has the capacity to handle up to 150,000 tons. They take the litter without charge, providing cleanout services (and thereby reducing growers' costs) in return. They find their current markets sufficiently profitable to believe that significant expansion would be warranted.

The impacts of the nutrient management requirements on other animal operations (e.g., dairy) have not been investigated. Washington County has animal production densities similar to the Lower Shore counties, suggesting it may experience some significant impacts (on the order of half the impacts seen in Worcester County). There may also be some localized impacts to other large animal operations in other counties (e.g., Frederick, Carroll).

There is a concern that Maryland farmers may be put at a competitive disadvantage by environmental regulations that are stricter than those of neighboring states. However, a survey of the other states shows that other states are tightening their regulations. Delaware requires phosphorus-based nutrient management plans for all agricultural operations that are greater than 10 acres or have more than 8 animal units. All animal wastes transported to alternative cropping

lands must be applied under nutrient management rules. Like Maryland, Delaware also regulates commercial fertilizer use. Pennsylvania was the first state in the region to enact nutrient management regulations. While the Pennsylvania law, which dates back to 1993, exempts small animal operations and only requires nitrogen-based nutrient management planning, it does affect most of the state's poultry producers.[20] The 1993 Pennsylvania law is also currently being reviewed. It is expected that the regulations will be modified to require phosphorus-based nutrient management planning and to track, and perhaps require, nutrient management planning for exported manure. Furthermore, the state is reviewing the Confined Animal Feeding Operation definition to decide whether to increase the number of agricultural operations covered by the law. In Virginia, essentially all poultry operations are required to have phosphorus-based nutrient management plans and animal waste management plans. Currently, there are no plans to require nutrient management plans for animal wastes transported off farms, though tracking and reporting requirements will apply. In sum, while WQIA imposed the strictest and most comprehensive nutrient management requirements in the region at its time of passage, it appears that all neighboring states will complete full implementation of stricter nutrient management regulations by 2005.

New federal regulations pertaining to nutrient management are also expected. Growing concern over pollution problems from animal agriculture nationwide has led federal agencies to reconsider the limited regulations currently imposed on only the largest animal operations. Starting in 1998, the US Environmental Protection Agency joined with the US Department of Agriculture in drafting a strategy for regulating animal feeding operations. A final draft of their strategy was released in late 2000. Additionally, the U.S. Environmental Protection Agency has proposed new regulations governing water pollution permits for confined animal feeding operations that are stricter and would apply to smaller operations than is presently the case.

Under the proposed federal rules, all animal waste applied to lands owned by an animal feeding operation would have to be done in accordance with a nutrient management plan similar to the comprehensive nutrient management plans currently being promoted by the National Resources Conservation Service. Animal waste transported to other lands would have to be tested for nutrient content and records would need to be kept. In contrast to Maryland nutrient management regulations, which apply to virtually all agricultural cropland, the federal rules will only require nutrient management plans for animal feeding operations. However, many agency personnel believe that final rules will require any lands receiving animal waste to have a nutrient management plan.

The federal regulations will also require co-permitting of any animal feeding operation under "significant" control of another entity. Most Maryland poultry growers would be regulated under this plan (depending upon the final animal feeding operation size definitions); the integrators would be co-permitted with growers due to the "significant" control they maintain. The State of Maryland is pursuing co-permitting, but in a different manner than specified in current proposed federal regulations. While Maryland is pursuing co-permitting by attaching poultry growers to the permits of poultry integrators, the federal regulations will seek to attach

[20] The exemption covers operations with two or less "animal units" per acre, where an animal unit is one head of cattle or equivalent number of other species.

poultry integrators to the permits of the poultry growers. The actual shape and effect of these co-permitting requirements is still unclear, however.

It is expected that Maryland growers complying with state regulations will automatically meet federal requirements for nutrient management planning and animal waste application. Depending upon the agreements between state and federal agencies, Maryland growers may see some increase in paperwork with implementation of the federal requirements. Nevertheless, the implementation of the new federal requirements will likely eliminate most, if not all, of any comparative disadvantage the Maryland poultry industry faces relative to other poultry producing regions. Unlike other regions with significant poultry production, Maryland has sufficient amounts of cropland that can accommodate the application of poultry litter, especially over time as excess PSI levels are reduced.

These new environmental regulations (WQIA in particular), have raised both economic and non-economic concerns among farmers. The economic issue is that regulatory requirements are seen as involving substantial costs to farmers for, in some cases, very little or no apparent environmental gain. Apart from its economic costs, the WQIA is seen as excessively intrusive to farmers and fundamentally to indicate a lack of respect for farmers' good-faith efforts in carrying out their farming operations responsibly (which have been substantial – see for example Lichtenberg, 2000). Excessive intrusiveness is seen in the requirement that regulatory employees of the State be granted a right of entry to any farm for purpose of WQIA enforcement. While such provisions are not uncommon in the regulation of business, they are new to much of agriculture (with exceptions such as sanitary inspection of dairy operations). Moreover, the extent to which these regulations apply to farmers' homes, typically located on their farms, is unclear, a situation that creates at least the appearance of unfair treatment relative to the non-farm population.

Other environmental issues in Maryland agriculture are important, but have been less contentious because state and federal policies have emphasized cost-sharing and technical assistance that has reduced the strain on farms' financial situations. The largest of these programs, the Conservation Reserve Program, pays rental fees to farmers in exchange for idling cropland that is highly erodible or which has high risks of surface run-off or groundwater seepage that would harm water quality. Under the recently expanded Conservation Reserve Enhancement Program (CREP), the payments have in some case risen well above the rental value of the land in agricultural production, and at the end of 2001 there was a queue of farmers desiring to sign up for this program.

The payment approach to conservation through acreage idling has a downside, too. The program could conceivably attract so much land that it caused problems for commercial agriculture similar to those caused by suburban sprawl – a shrinkage of the cropland base that supports both crop and animal enterprises. The acreage enrolled thus far in all the cropland-idling conservation programs together is 31,094 acres, or 1.9 percent of Maryland's cropland. Even in the counties with largest participation, on the lower Eastern Shore, the fraction of cropland in these programs is not large. Somerset County has an estimated 7 percent of its cropland in CREP, with about 5 percent in Dorchester and Worchester Counties. Recent expansion of land eligible for buffer strips along streams or other surface water bodies from 180 to 300 feet has raised concerns of further losses of cropland for farming purposes.

Labor Constraints

An indicator on the cost side that some in the stakeholder groups have pointed to as a source of economic problems is the cost and availability of hired farm workers in Maryland. In 2000, the average wage rate paid to hired farm workers, according to USDA's surveys, was $8.51 per hour in Maryland, a premium of 5 percent over the U.S. average farm wage rate, and higher than farm wage rates in Pennsylvania and Virginia. This premium is not large, and in fact Maryland farm wages are now lower relative to U.S. average farm wages than has been the case historically.

Concerns are related less to wage rates than to availability of reliable workers and labor regulations, mostly state-level. Employers have been hiring increasing numbers of temporary foreign farmworkers through the H-2A program. In 2001 (as of July 31), 444 jobs, or about 8 percent of the total farm labor force, were certified for temporary foreign guestworkers in Maryland. The lion's share of these H-2A workers are used in nursery and greenhouse operations and vegetable production, predominately located on the Eastern Shore. According to the administrator of the Maryland H-2A program, "the limiting factors are the cumbersome lead time for employers, the lack of certified housing for guestworkers, and administrative pressures" (Williams, 2001). The program is helping to bridge the labor gap by offering a legal means for securing temporary foreign workers when needed, but the paperwork and procedural requirements of using it severely restrict its value for the small-scale employer – which most Maryland farm employers are.

Labor issues are important and worth careful attention by policymakers, as discussed in the following section of this report. They are particularly important for labor-intensive commodities such as fresh produce and poultry processing, and pose particular problems for smaller-scale operators. But overall, labor issues do not appear as threatening to the future of Maryland agriculture as the competition for land, the low economic returns, and the environmental issues that have been discussed earlier.

Loss of Respect for Agriculture

A general problem brought to mind by the regulatory situation, which goes beyond environmental problems to labor management issues (such as provision of housing and other facilities needed to meet state and federal standards) and permits needed to undertake many improvements such as irrigation or drainage projects, is a perception that the state is decreasingly friendly to agriculture and farmers. This encourages retirements and other exits from farming, and discourages new entrants. It creates a climate that furthers the current tendency to depreciate the capital stock in agriculture and to avoid new investment. The capital stock in Maryland agriculture has declined substantially over the last two decades – although this is not a phenomenon unique to Maryland, as discussed earlier. To remain economically viable in the future, substantial investment is essential to make the commodity and market niche adjustments necessary, to stay on the frontier of new production technology and methods, and to comply with environmental and other regulatory requirements. This can only occur when producers have sufficient optimism about the economic future of their enterprises.

Transportation Issues

The Port of Baltimore has provided a valuable part of the transportation infrastructure for exported commodities in the past, but has dwindled as an outlet for grains and oilseeds, and animal products, notably chicken. The overall East Coast transportation infrastructure is sufficient to replace that loss, but as the cost of moving Maryland's commodities to markets increases, the price of Maryland farm-level prices relative to other U.S. and world market prices tends to decline. The recent history of grain exports through the Port of Baltimore provides evidence on the economic importance of this factor. The Port has provided a valuable part of the transportation system for exported grain in the past, and until last year continued to command approximately 2 percent of all U.S. exports of grains (Figure 31). However, in June 2001 the Archer Daniels Midland (ADM) Countrymark Grain Facility at the Port collapsed. The collapse of the 80-year-old pier means that since June of 2001 no grains have been exported out of the Port – for the first time in 100 years. There remain competing ports out of the East Coast through which Maryland grains can be exported (e.g., Norfolk, Charleston). Unfortunately, additional transportation costs ranging from 15 to 25 cents per bushel are incurred, and Maryland prices have fallen accordingly.

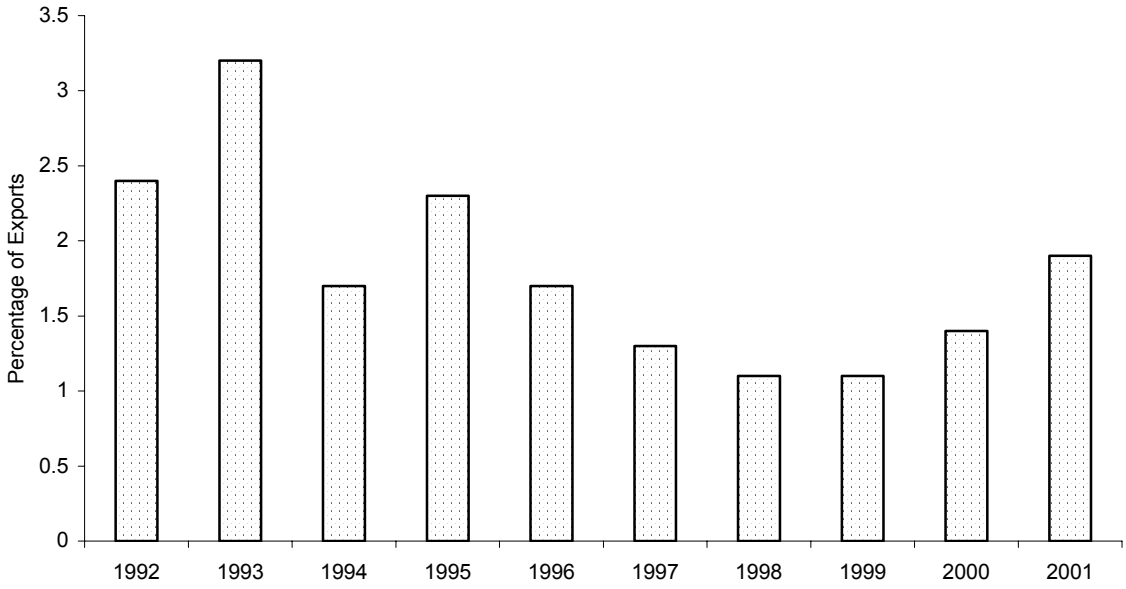

Figure 31. Percentage of Total U.S. Grain Exports Through the Port of Baltimore
Source: USDA, Federal Grain Inspection Service

A decline of 20 cents per bushel of wheat, corn, and soybeans reduces the value of Maryland's output of these commodities, at recent production levels, by about $15 million. While loan deficiency payments have increased to reflect local price declines, unless the pier is repaired the Maryland Grain Producers estimate that Maryland agricultural income will be reduced by approximately $4.4 million dollars.

As of mid-2002 an agreement between ADM, the Port of Baltimore, the Maryland Department of Agriculture, and the Governor's office on terms for repairing the pier had not been made. These parties are in discussions as to who is responsible for the cost of repairing the port and who will consequently receive delivery fees (which will go toward the cost of repairing the port) over the next several years.

Financial Constraints

Even if market conditions for traditional commodities or new enterprises are sufficient to support commercial agriculture, the financial requirements for investment at a sufficient scale of operation to generate an adequate household income may severely limit the opportunities for full-time farming. This is especially true given the high average age of Maryland's farmers. The next generation will have to either inherit or purchase a substantial capital stock, and often the generational succession involves both older and younger generations jointly operating the farm for an extended period. In this case the economic returns have to be sufficient to support two households, the older one typically with accumulated wealth to draw upon but the younger with very little. Apart from family assets, which for independent young farmers are typically lacking, the crucial financial input is credit.

Credit constraints could be a cause of underinvestment, but our analysis of farm financial data and discussions with both lenders and borrowers suggests that credit is readily available for promising investments at competitive market terms. Maryland is actually in a favorable situation compared to the U.S. as a whole with respect to key financial indicators. Maryland farmers' average debt to asset ratio is lower than the national average, and the net worth of the average farm operation at the beginning of 2001 was $545,000 in Maryland as compared to $460,000 for the U.S. as a whole, despite the smaller average size of Maryland's farms.

The distribution of wealth among farmers, as among the population, is quite unequal. We do not have comprehensive state-level data from government surveys, but data of MidAtlantic Farm Credit provide the overall picture for their several thousand Maryland borrowers. On 2,675 records for which assets and liabilities are reported, the following are net worth categories:

net worth (assets – liabilities)	number of accounts
less than $100K	263
$100-500K	1103
$500K-$1M	587
$1M-$3M	547
$3M-$5M	103
more than $5 million	62

The average net worth is $994,000, including 28 accounts with zero or negative net worth.[21] The fraction with less than $100,000 in net worth is relatively small at 11 percent of these accounts. But many asset-poor producers or potential producers will not be in the MidAtlantic credit accounts at all. At the other end of the scale, 27 percent of these accounts have net worth over $1 million and thus will have to do at least some planning to deal with estate taxes that could otherwise seriously impair the generational succession of the farm operation.

Overall Outlook

The future of agriculture is at risk in Maryland because of uncertainties surrounding many of the factors we have been discussing. But in view of the general success with which Maryland's farmers have dealt the many economic threats that have appeared over the last two decades, and the evidence that producers are already adapting to the changing market and policy-driven demands placed upon them, our baseline projection for the next decade is for continued decline, but only at a relatively slow and manageable rate. We expect a further loss of about 40,000 acres of farmland by 2010 (2½ percent of current land in farms), but we do not expect an economic crunch that would cause general economic hardship. With respect to farm numbers we expect that while the size of dairy operations and some other farm enterprises will increase, the percentage of farms that have relatively small acreage will increase also, and that the number of farms will decline at the same rate as farmland, which would imply a loss of 200 to 400 farms by 2010. The rates or loss of both farms and farmland are lower than historical rates in the post-World War II period, but are similar to those of the 1990s.

The prospects, and policies for dealing with risks to the future of agriculture, differ by region of the state. The main differences are between the three types of counties discussed earlier: metropolitan, metropolitan fringe, and nonmetro. Figure 32 shows our projections for farm numbers in all three types of counties. The rate of loss is well below those of earlier years discussed above and are even below the reduced rate of decline seen in the 1990s. This is not just conjecture. USDA's statewide farm number estimates have remained constant at 12,400 for 1999, 2000, and 2001.[22] Note that the projected rate of decline is higher in the nonmetro counties than in the metro counties. The reason for this is that the nonmetro counties have more of the traditional type of crop and livestock enterprises where increased scale of operation (in terms of acreage per farm) is more important; and that while suburban sprawl affects almost all counties, zoning and farmland preservation programs are being more intensely pursued in the metro and fringe counties.

These same factors influence our projections of land in farms, shown in Figure 33. The rates of loss have been slowing in recent years and we project a continuation of the slowdown. To consider the extent to which the slower decline is a matter of preserving pasture or idled land in suburban areas, it is more informative to look at harvested cropland acreage, as a better indicator of the extent of commercial farming in an area. Figure 34 shows harvested crop acreage for most of Maryland's counties since 1960. The persistence of cropping activity in every county is

[21] The USDA data cited above, which place the average net worth of all Maryland farms at $545,000, indicates the substantial absence of many of the lower-wealth farms from MidAtlantic Farm Credit accounts.
[22] See USDA, National Agricultural Statistics Service, "Farms and Land in Farms," February 2002.

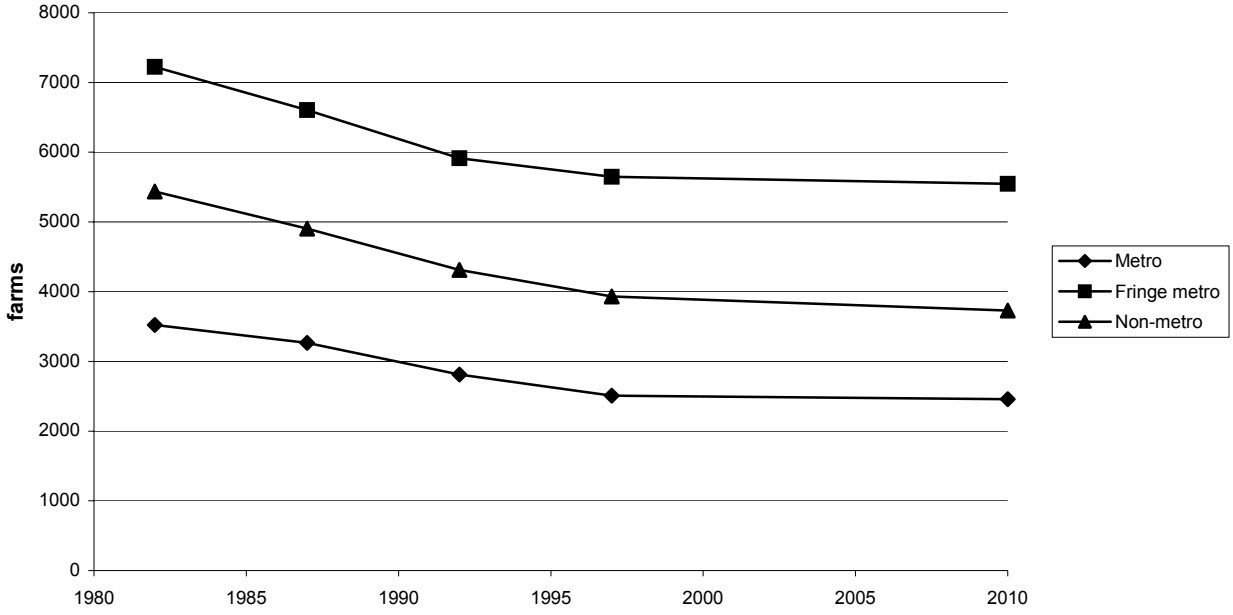

Figure 32. Projected Farm Numbers by Type of County
Source: USDA and authors' estimates

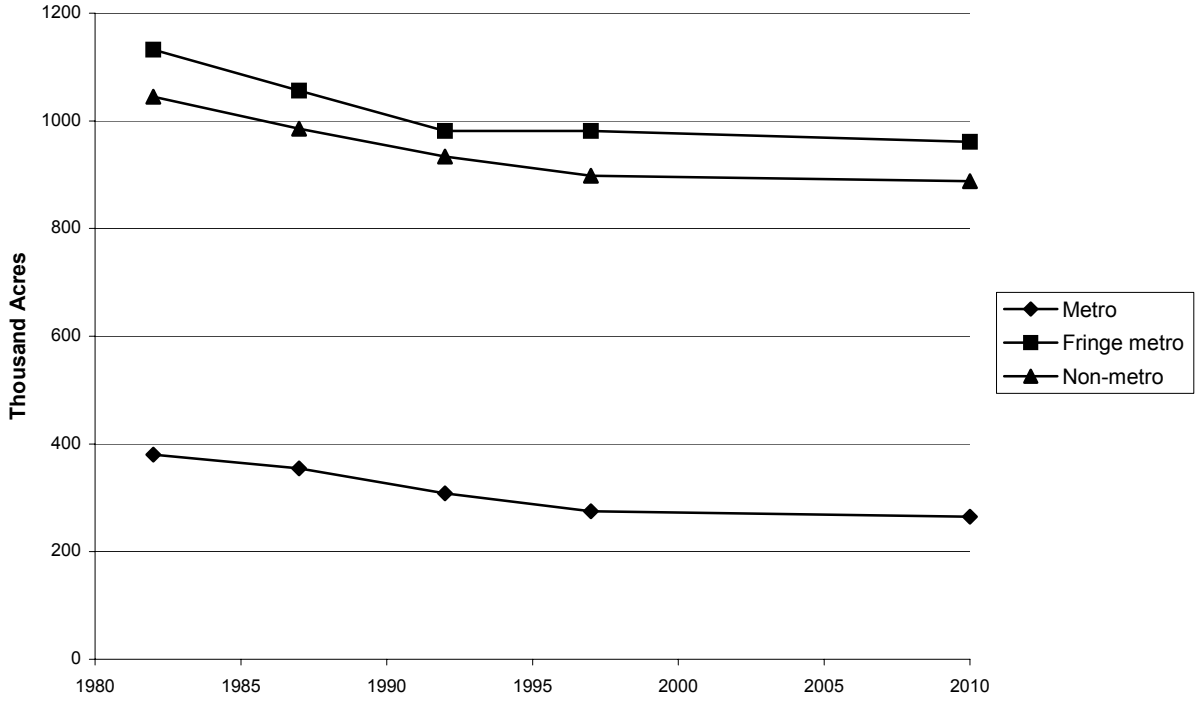

Figure 33. Projected Land in Farms by Type of County
Source: Census of Agriculture and authors' estimates

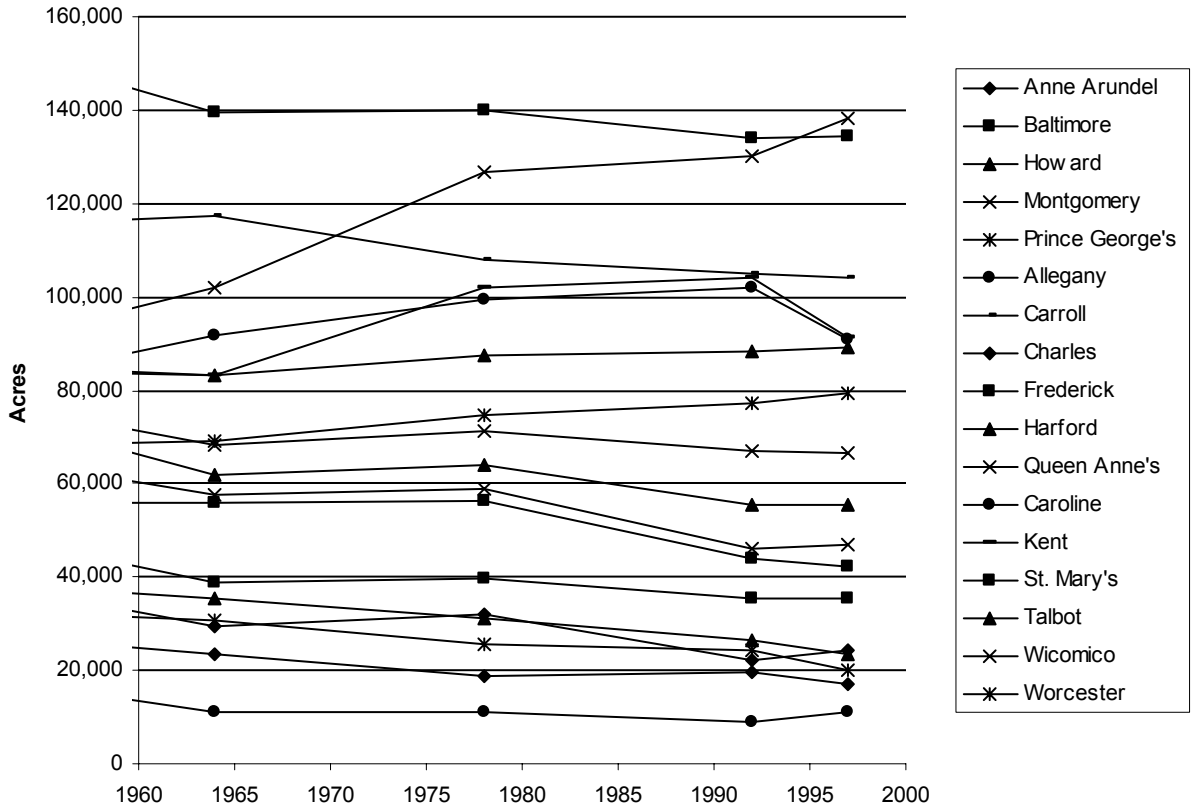

Figure 34. Harvested Cropland, Maryland Counties
Source: Census of Agriculture and authors' estimates

striking. Even the most urbanized counties – Baltimore, Montgomery, and Prince George's – maintain substantial cropland bases. This finding is especially notable in view of the evident continued expansion of housing and commercial development on former farmland. There is a literature that postulates a development process under which the decline of farming in suburban areas becomes inexorable, with farm activity eventually falling below a "critical mass," after which decline accelerates into insignificance and essentially all the farmland is converted to nonagricultural uses. At the edges of urban areas this has indeed occurred in Maryland, so that farming is now absent in large parts of our metropolitan counties. But each of these counties has at the same time managed to maintain large areas of farm acreage.[23] Our forecast is that this record will be maintained, at least for the next decade.

What about the longer-term outlook? We have focused on projections to 2010 and 2020. By 2020 Maryland will have grown by approximately 600,000 additional residents over the population of 5.4 million as of July 2001, to a total of 6.0 million according to Census of

[23] Loretta Lynch of the Department of Agricultural and Resource Economics at the University of Maryland has recently completed a detailed analysis of the critical mass issue in Maryland, in a project sponsored by the Maryland Agro-Ecology Institute. That study finds that since 1970 suburban farm numbers have not shown a tendency to accelerate their decline, i.e., that no critical mass has been reached. See Lynch (2002).

Population estimates.[24] The added population plus desire for suburban space for more of the existing population will cause problems, but they appear manageable, as already discussed.

The risks are greater and potential problems more intractable if we project these trends further into the future, for example to 2050. The state's population could easily grow by another million by then. Over this longer time span the population will gain further in affluence and the average household will acquire more space. If an additional million people have an average of two persons per household and one-half an acre of land, they will occupy 250,000 acres. If half this acreage is converted from farms and half from forest lands (roughly the proportions of the past), the state would still have 1.9 million acres of farmland in 2050 (compared to 2.1 million now).

The preceding projections constitute our baseline scenario for the immediate future of Maryland agriculture. By "baseline" is meant commodity markets rebounding modestly from the current lows as USDA's long-term commodity price baselines project, and commodity and regulatory policies that essentially continue what has been in place since 1996.[25] The future could easily be substantially worse or better for Maryland agriculture. In part, events will depend upon climatic and market forces which no one can predict or control for a decade-long future. But most importantly, what happens will also depend on local, state, and national policies that impact agriculture. With respect to the slower rate of loss of farmland and farms that emerged in the 1990s and we project to continue, the question arises as to the roles of farmland preservation programs, zoning or other anti-sprawl policies (such as restraints on road building), or housing market forces. The next section discusses policy alternatives most likely to make a difference.

[24] Other estimates range up to 6.5 million by 2020. The main unknowns are the level of future immigration into the United States, and where new immigrants as well as people who move between states will locate.

[25] This means commodity policies about as supportive as those of 1999-2001, with spending on commodity programs of about $20 billion annually as long as commodity prices stay as low as they have been. With respect to land use and environmental policy it means continued land preservation policies at the current scale and continued conservation programs that function primarily through matching funds from government sources to assist farmers in meeting conservation/environmental goals.

POLICY ISSUES AND ALTERNATIVES

A number of specific policies will be important for the future of Maryland agriculture, but it is helpful to start with a general division of opinion that prevails among those whom we consulted in preparing this report. One general view is that the best focal point for state-level and perhaps even national policy is a set of land preservation and conservation programs. Policies in these areas offer the most promise for maintaining land in farms while gaining support of the nonfarm population by promoting environmental goals and maintaining the scenic vistas that make rural Maryland so outstandingly attractive to all who dwell or visit.

A counter-view is that these programs will accomplish little or nothing in the way of preserving agriculture as a commercial activity supporting traditional family farms. For that, what must be attained are economic conditions that enable returns to farming that will attract new entrants to farming, induce new investment, and encourage established farmers not to abandon their existing operations. The purest statement of this position is that if farming were made economically viable, farmland preservation programs would be unnecessary even in the central metro counties.

This bifurcation of views reflects the fact that urbanization is a two-edged sword for farmers. On the one hand, urbanization impinges upon farmers, making the farming enterprise more costly and difficult. Development pressures raise the price of land; reducing the economic return to farming and increasing the potential gains by switching land to nonfarm uses. Residential expansion has also created conflict between farm operations and residential amenities in many communities. At the same time, urbanization provides opportunities for agricultural enterprises to take advantage of nearby urban markets by altering their marketing and/or changing product mixes. Prospects for off-farm employment also increase with urbanization.

A policy issue that arises with respect to improving the economic viability of farming is the extent to which that end can be promoted through nationwide commodity programs. In 2000, an estimated 42 percent of Maryland farms received government payments, an average of $26,902 per farm. Table 18 shows state total amounts for the main programs. Historically, Maryland farm operators have been less dependent on government payments as compared to the U.S. average, and particularly to farmers in the twelve Midwest states.[26] But due in large part to the recent emergency assistance payments, Maryland farmers are receiving substantially more (Figure 35). In 1995, Maryland farmers received about one-third of the nation's average in government payments and one-fifth of farmers in the Midwest. By 2000, government payments per Maryland farm had reached about two-thirds of the national average.

The $88.5 million Maryland farmers received in commodity program payments in 2000 amounts to about 20 percent of the state's net farm income. In order to appreciably improve the economic viability of Maryland producers significantly enough to be confident of profitably keeping their land in farming, it would take at least a doubling of current outlays, and even that

[26] Illinois, Indiana, Iowa, Kansas, Michigan, Minnesota, Missouri, Nebraska, North Dakota, Ohio, South Dakota, and Wisconsin

Table 18. Maryland's Federal Program Payments, 2000

	Million $	% of U.S. Total
Production Flexibility Contracts	13.8	0.3%
Loan Deficiency Payments	32.3	0.5%
Conservation Reserve Program	5.3	0.3%
Emergency Assistance	34.3	0.4%
Miscellaneous 1/	1.5	0.8%
Marketing Loan Gains	1.2	0.1%
Total	88.5	0.4%

Source: USDA Farm Service Agency
1/ Crop Loss Disaster Assistance, Dairy Market Loss Assistance, Livestock Emergency Assistance, Oilseed Program, Tobacco Loss Assistance, and Wool and Mohair Market Loss Assistance.

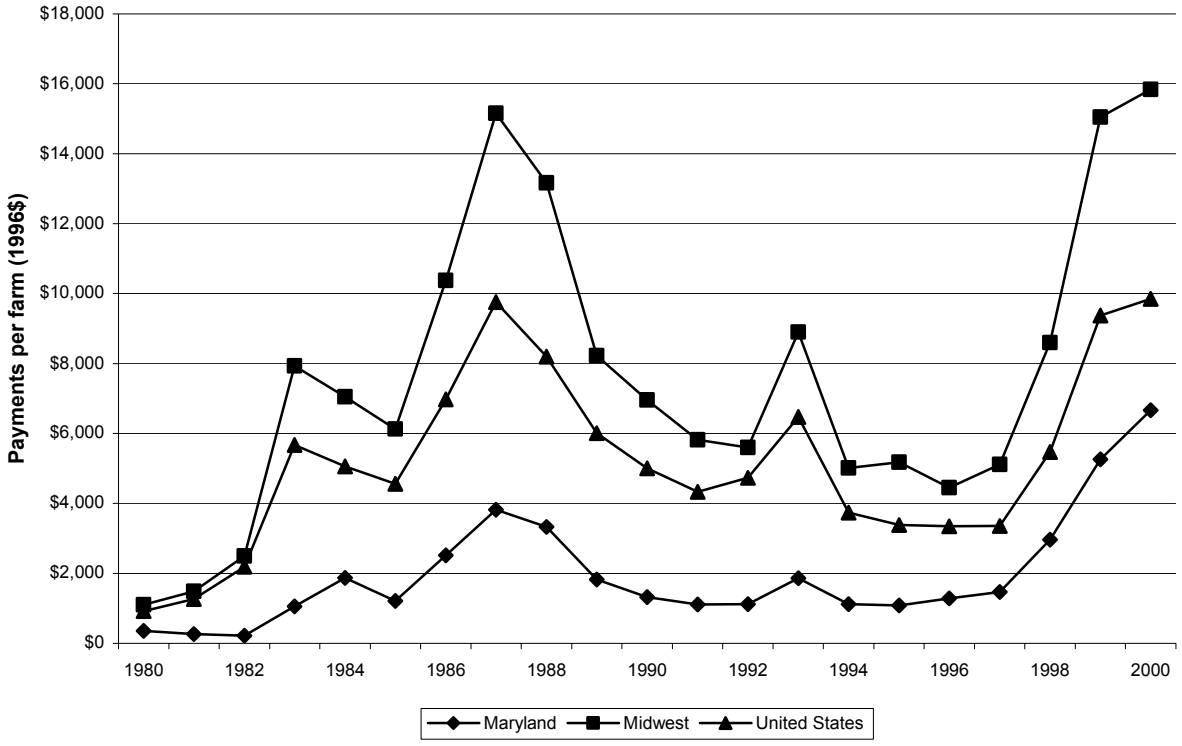

Figure 35. Government Payments per Farm, 1980-2000 (1996 dollars)
Source: USDA, ERS

would not be enough to make agricultural use of land in the central metro counties competitive with development alternatives. Some in the 2002 farm bill debate argued that a shift of emphasis to spending several billion dollars on conservation/environmental programs would serve Maryland and other Eastern farmers better than current commodity programs. The Senate passed a farm bill that, as compared to the House bill passed in 2001, transferred funds from commodity program payments to conservation/environmental programs. The funds would be distributed to

farmers as payments in either bill and in the final legislation enacted in 2002.[27] A problem with conservation or environmental payments, however is that farmers' receipts for such funds would be tied to new undertakings by farmers that may be costly, while commodity programs pay them for doing just what they are already doing anyway. On the other hand, the nonfarm population sees more of a benefit from the conservation/environment approach and is therefore more likely to support the necessary government spending over the long term.

Nonetheless, it remains the case that the net gain to farmers per dollar spent on farm programs is substantially larger for current commodity programs than would be the case for conservation/environmental programs as typically structured. Moreover, the hard truth is that Maryland farmers to date have shared as little in conservation program dollars as in commodity program dollars. In 2000, for example, Maryland accounted for 0.8 percent of the nation's agricultural output but received only 0.3 percent of FAIR Act (fixed contract and loan deficiency) payments. But Maryland's share of Conservation Reserve Program payments, 0.2 percent, was even smaller. The relatively large and increasing role of non-program commodities in Maryland means that our state is relatively disadvantaged in federal programs generally.

Farmers' benefits from conservation/environmental programs depend heavily on state-level funding. The Maryland state budget for Fiscal 2001 contains $6.2 million for cost sharing on practices to reduce soil and nutrient runoff, $1.5 million for cost sharing on cover crops, and $0.3 million for cost sharing on poultry litter transportation. This is the foundation for valuable assistance to farmers but it would have to be expanded greatly to compete with the sums offered under commodity programs.

Recent developments in both commodity and conservation programs have renewed potential conflicts between the interests of nonfarm landowners and farm operators who rent cropland. With respect to establishment of base payment acres under the 2002 Farm Act, both landlord and tenant must agree in filing with the Farm Service Agency of USDA, a complicated undertaking when a farmer deals with several landlords and when some landlords are far removed in both location and hands-on experience from the farm in question. With respect to increased incentives for placing land in conservation programs rather than producing cash crops, some farm operators are finding themselves increasingly squeezed in opportunities to find sufficient cropland to achieve an efficient scale of operation.

Recent experience indicates that for some farmers the most promising future lies with non-program crops, including niche activities that embody substantial services beyond those of just growing the crops. It is nonetheless important to keep in mind that the bulk of Maryland's cropland acreage, if it is to stay in agriculture, must remain in the traditionally grown grains and soybeans. This basic agriculture, centered on the Eastern Shore, has grown symbiotically with the broiler industry and each is necessary to the other. Maryland's grain growers are placed in a better long-term economic position by the premiums over Corn Belt grain prices that the demand for chicken feed creates than by price support programs. It is not so much that the locational

[27] The Farm Security and Rural Investment Act, signed into law in May 2002, adds funds and activities to existing conservation programs and introduces the Conservation Security Act, which will make payments under contracts with producers, beginning in 2003, for conservation practices on farmed land. The administrative details are still to be worked out.

premiums are large, which they are not, but that if Maryland had to ship its grain elsewhere the costs could be sufficient to result in Maryland prices below U.S. averages. As the earlier discussion of price changes following the closure of grain exports from the Port of Baltimore indicated, the cost to Maryland producers could easily be $.30 per bushel on corn and soybeans. This would mean a loss of revenue to farmers of $25 million annually. Since input costs would remain the same, the reduction would come from either reduced land rents or farmers' net returns. Spread over the state's 1.4 million acres of harvested cropland, this would reduce returns by $18 per acre – in many cases the difference between profit and loss. So state-level policies that can promote the continued viability of broiler production in Maryland are arguably the most important agricultural policies the state can implement.

For all the preceding reasons it is not realistic to look to national policies to improve the long-term outlook for Maryland agriculture. What can the state government reasonably do? The general thrust that appears most promising is to undertake public investments and foster private investment that will advance the state's comparative advantages and create new ones. Every state – including Maryland – across the country supports value-added agriculture in some fashion. The programs offered relate to the types of agriculture in each state, with state-grown product promotion and labeling programs being the most popular. Some states (e.g., Georgia, Kentucky) also facilitate branding by providing applications for certification online. Other states subsidize loans or offer loan guarantee programs, grants, tax abatements, or other financial incentives to businesses that process agricultural products. All of these financial assistance programs are coupled with business planning technical assistance. Such programs address the twin problems of insufficient technical/financial expertise and financial capital. By reducing the costs to lenders of making loans, the state shares in the risks of financing new value-added agricultural activities. Though many states emphasize rural development as the objective, having more value-added agricultural activities, such as food processing facilities, does not necessarily lead to increased rural income or employment. In fact, recent research indicates that the overwhelming majority of food processors are located in metropolitan counties. In this respect, Maryland is favorably located for such programs since our farm and metro areas are already so thoroughly integrated.

Agricultural marketing assistance could be used to more effectively exploit alternative marketing channels. Export promotion has been utilized by many state agricultural departments, but this approach is relatively less helpful for Maryland, apart from broilers, because the state is typically a net importer of grain. Maryland has been effective in facilitating the development of farmers' markets. But further issues could be explored specifically related to the barriers of increased participation in direct marketing and value-added agricultural activities. For instance, small scale farmers and food processors need assistance in complying with the panoply of food safety, labor, and environmental regulations at the federal, state, and local levels.

Despite the limited acreage they can plausibly occupy, non-program crops, including niche activities that embody substantial services beyond those of just growing the crops, are an income earning opportunity that is well worth continued support and expansion. Farmers' markets are an example discussed earlier. Given the potential for additional producers, educational workshops on production and sales for farmers markets may be useful. These workshops could be a joint activity of MDA and MD Cooperative Extension.

Opportunities are also open for animal enterprises selling retail products and services. Although the data are insufficient to quantify the rate of growth, horse-related enterprises are flourishing. Direct animal and poultry products marketing is limited by a number of regulations and marketing institutions. For meat production, no custom slaughterhouse with USDA inspectors exists. Establishing a state meat inspection program and reviewing the regulations for meat and poultry processing with new technology could overcome this limitation. State livestock grading and meat sales promotion are other new programs that would be useful. The College of Agricultural and Natural Resources also could provide more research and educational programs in alternative animal and poultry production and processing. A specific limitation is that the number of veterinarians with expertise and experience with such production situations are limited. Developing extension programs to provide information to currently practicing veterinarians may be helpful, as would scholarships for students who agree to specialize or gain expertise in meat production animals

The limited MDA and Maryland Cooperative Extension Service commitment to alternative animal and poultry enterprises is consistent with Maryland's agricultural history. When the main emphasis was on producing commodities sold in national or regional formal markets, programs for meat animals and on-farm processing were unneeded as these enterprises were not important in Maryland. However, the emergence of demand for local, specialized products suggests the value if reorienting agricultural regulation and educational programs. The farmers' market program is a prototype for future emphasis on retaining locally grown food.

One of the strategic goals of the College of Agriculture and Natural Resources is Food Safety. Part of this activity could emphasize small food processing units for specialty products. One example is the recently developed extension program in farm dairy processing that should be maintained or expanded. Similar extension/research programs on small meat processing units could also be considered. Development of food processing systems for farms and other small establishments could also be a research topic; this program would focus on development of small scale systems that meet health and sanitation standards so that they are not as much of a barrier to farm retailing of processed products.

Maryland has been a national leader in enacting farmland preservation programs including conservation easements, purchase of agricultural easement programs, right-to-farm law, and differential assessment, as discussed earlier. At the local level, Maryland jurisdictions have enacted programs centered on comprehensive planning, right-to-farm ordinances, and transfer of development rights programs. Given the goal of ensuring the survival of the agricultural economy by preserving productive farmland, specific objectives for these programs have included: maximizing the number of preserved acres; preserving productive farms; preserving farms most threatened by development; and preserving large blocks of land.

During 1996-2000, the state's Maryland Agricultural Land Preservation Fund (MALPF) received 1,347 applications from landowners. Appraisals were requested for 986 of these applications. MALPF had sufficient funds to purchase 469 easements or 45 percent of the appraised properties (MALPF, 2001). Total expenditures including the county matching funds were $102.5 million. The program had purchased easements on more than 185,871 acres statewide by June, 2000 at a cost of $232.8 million (Chesapeake Bay Commission 2001, AFT

2001a). Total expenditures including the county matching funds were $102.5 million. Altogether, counties have expended for local purchase of development rights programs and MALPF matching fund $287.3 million (AFT, 2001b). To date, MALPF, local programs (including TDR programs), private land trusts, Maryland Environmental Trust, and Rural Legacy have preserved approximately 400,000 acres (or will have when all allocated funds are spent).

Our research indicates that such programs can have substantial effects, and have played a significant role in the recent slowdown in the state's loss of farms and farmland. Nonetheless, much could still be done to improve participation in state and local agricultural land preservation programs and to provide a more effective use of existing resources available to purchase agricultural land easements. One barrier to making informed policy choices about farmland protection is the difficulty in assessing detailed data available on the reasons for and impact of farmland conversion.[28]

Evidence that incentive programs can make a significant difference is provided by the history of preferential property taxation. To ensure that agricultural landowners do not leave farming due to an inability to pay the property tax on their land as it becomes more valuable, Maryland introduced a preferential tax rate for farmland in 1956. Instead of the assessment of the land for property tax purposes being based on its highest and best use value, the assessment is based on its agricultural value – the amount the farm is worth in terms of its stream of agricultural income. As an example of the benefits to owners of farmland, if the land were assessed based on its highest and best use at $9,000 per acre, a 100-acre farm would have a tax bill of more than $10,000. At the agricultural assessment of $400 per acre, the owner would owe $560 for the entire farm. To save the $95.20 per acre per year, many landowners would be willing to pay someone to farm the land for them. Lynch and Carpenter (2002) found that having a preferential property taxation program slowed the rate of farmland conversion from 7.58 percent for an average 5-year period to 3.58 percent all else the same.

Another issue in farmland preservation is creating a stronger linkage among the various farmland protection, natural resource, and agricultural economic development programs in areas where farmland is threatened. If a farmer has made a commitment to permanently keeping the land in farming, it is arguable that the public should provide some assistance in helping to retain a working and profitable farm. Some counties – in particular, those with established offices of agricultural economic development – are well on their way towards fostering such a linkage.

Farm labor supply needs are a persistent problem for farm employers and are complicated by the unpredictable nature of farm labor demand. Currently, foreign workers can be employed temporarily in agriculture under the H-2A provisions of the Immigration and Nationality Act. The program is helping to bridge the labor gap by offering a legal means for securing temporary foreign workers when needed in Maryland. However, there are a number of limiting factors – cumbersome lead time for employers, lack of certified housing, administrative pressures – that could be corrected by increased funding and Federal legislative changes. A state program to assist with development of worker housing may facilitate use of this program. In addition,

[28] The Maryland Department of Planning has established a geographic information program on land-use change by detailed parcel. Such a program – with on-going funding support – will help improve our ability in quantifying the development threat to farmland in Maryland.

proposed federal legislation would liberalize the program and also provide immigrant status for some undocumented workers.

Overarching Issues in Policy

Wide agreement exists on many of the issues that have been addressed, although an underlying issue of contention over funding is never far from sight when programs that use public funds are involved. Apart from the funding question, a few broad areas of tension surface occasionally that warrant attention.

One such issue is preservation of farmland as contrasted with survival of commercial farm enterprises. Urban and farm interests can easily agree that open space and lack of congestion are goods worthy of support. But some non-developed uses of land are much more valuable to the rural economy than others, and some of the more valuable uses economically are seen as less valuable by the nonfarm public. Indeed, restrictions on farming activities are increasingly on the agenda in some jurisdictions, and these can be counterproductive as ways to preserve agriculture over the long term. Means of keeping land in farming such as restrictive zoning can be particularly divisive, because they often reduce farmers' asset values even as they keep land from being developed.

Similar tensions arise in the area of environmental protection. It is widely accepted that agriculture is more suited to wildlife, air quality, and other environmental values than industry, commercial development, or suburban housing. But at the same time, some environmental problems such as water pollution have been attributed to agricultural activities as discussed at length earlier. Compromises have been reached, principally by having the public share with farmers the costs of environmental improvements, but sparring over details of legislation and regulation, as currently with implementation of the state's Water Quality Improvement Act, is a source of continuing contention.

Less widely felt but also significant tensions exist between those who desire a focus on small-scale farming, organic or health-related products, self-sufficiency in food production, or gentler treatment of livestock in animal enterprises on the one hand, and business-oriented focus on economies of scale and advanced technology (including biotechnology), and global markets on the other hand. These tensions come to the fore in opinions about and support for commodity programs for traditional crops, state and federal regulation of agriculture and food, as well as other policies.

There are also judgments about the relative merits of a focus on niche markets and high-value, differentiated products as compared to fostering the best possible economic situation for longstanding bulk grain and livestock production. It is worth noting that some "niches" are becoming quite large. For example, as of 1997, USDA estimates 22,000 pleasure horses in Maryland farms, not insignificant as compared to 84,000 milk cows.

One of our findings in dealing with a variety of individuals and stakeholder groups in preparing this report is that there are ways to get beyond these tensions and find common ground. For example, we can recognize both that the acreage plausibly devoted to high-valued crops and

livestock enterprises is small compared to the 2.1 million acres that remain on Maryland's farms (so it is suicidal to believe we can neglect traditional commercial agriculture); while at the same time we can recognize that a great and increasing proportion of the vital energy that generates investment and future economic returns is to be found in non-traditional, creatively marketed, and labor and management-intensive products that fall into niche market categories and are undertaken on small acreages (and that moreover the heavily urbanized conditions of Maryland give the state a comparative advantage in such enterprises that we do not have in traditional crops and livestock). Thus, our policies should be simultaneously pushing on both fronts.

The kinds of efforts that can succeed in transcending the divisions of opinion and interests can take place among the more committed of the state's citizens through voluntary groups such as the Maryland Agro-Ecology Institute. But these groups have only a limited reach, and involve people who are typically well informed or easy to inform new information emerges or to correct when misinformation is abroad. A tougher issue is reaching consensus among the broad public of the state, where people are less well informed, and misinformation is hard to eradicate. State-level outreach and action, for example through the Maryland Cooperative Extension Service and the Maryland Department of Agriculture, can help through educational programs that air the facts and issues in sufficient detail that the broader interested public can make informed and intelligent choices and help achieve reasonable compromises in areas where full agreement is impossible. But the most important people to reach are outside the traditional farm-related audiences that these institutions are used to dealing with. From the viewpoint of the state's farm community, a lot could be achieved though wider public appreciation of the continuing contribution that all elements of the farming sector make to both the state's economic well-being and its desirability as a place to live, and of the costs and tradeoffs involved in the range of policy alternatives being advocated.

ANNEXES

The following annexes spell out procedures followed in carrying out this work, and present details that give necessary background but would have unduly lengthened the Report.

Annex I. Study Procedures

This report presents the findings of a study carried out by the Center for Agricultural and Natural Resource Policy at the University of Maryland's College of Agriculture and Natural Resources, under contract with the Maryland Department of Agriculture. The information for the study comes from U.S., state, and county data available from published and unpublished public sources, and from interviews and discussions with approximately 100 individuals and groups professionally involved with agriculture.

The agenda for the project covered three areas: a comprehensive assessment of the situation in Maryland agriculture, analysis of trends and the major factors bearing on future developments, and alternative policies and programs that could help ensure a prosperous, sustainable Maryland agriculture in the future. The principal sources of information for all three areas are statistics from government agencies and surveys of farmers, data received from several private sector institutions, and the information and perceptions of many stakeholder groups and individuals. The MidAtlantic Farm Credit cooperative was particularly helpful in providing detailed data relevant to the financial situation of Maryland farm enterprises.

Some of the policy issues discussed, both past and present, are controversial. We do not provide recommendations or policy advice, but rather try to remain as objective as possible in assessing the situation, the consequences of past policies, and the prospective achievements of future policies.

A presumption underlying this report is that the disappearance of farms and farmland in Maryland is a problem to which a public policy response is appropriate. It might be argued, however, that such changes are the results of farmers' and others' well-considered decisions in response to market conditions, and the presumption should be a policy of non-interference with market forces. Our reasons for working from the former rather than the latter presumption are: first, that current farming and land use decisions are not taking place in an unrestrained market situation but are already influenced by governmental interventions such as zoning, public investment in infrastructure, and a variety of regulations and tax policies; and second, that opinions of individuals and groups and other evidence indicate that farming in Maryland generates external benefits and costs beyond those accrued by the actors involved. The first point militates against the presumption that no further policy is the best policy, and the second supports the presumption that the direction of further policy most likely to be beneficial is in the direction of preserving farms and farmland. Nonetheless, any particular policies chosen should pass appropriate benefit-cost tests, and this report does not make recommendations for such policies although we do discuss policy options.

Annex II. Stakeholder Groups and Individuals Consulted

American Farmland Trust, Washington, DC
Mr. Ralph Grossi, President
Ms. Allison Beets, Outreach Coordinator, Mid-Atlantic Regional Office, Culpeper, Virginia
Ms. Donna Mennitto, Field Projects Specialist, Washington, DC

American Forest Foundation, Washington, DC
Stephanie Brown, Deputy Director, American Tree Farm System

American Tree Farm System, Chesapeake Beach, Maryland
Mr. Howard Anderson, Chair

Calvert County Department of Economic Development, Prince Frederick, Maryland
Mr. James Shepherd, Agricultural Coordinator

Carroll County Department of Economic Development, Westminster, Maryland
Mr. Gabe Zepp, Agricultural Marketing Specialist

Cecil County Office of Economic Development, North East, Maryland
Ms. Joanne Richart-Young, Agriculture Coordinator

Charles County, Department of Planning & Growth Management, La Plata, Maryland
Mr. Roy E. Hancock, Director
Mr. Steve Magoon, Planning Director

Charles County Economic Development Commission, La Plata, Maryland
Mr. Aubrey H. Edwards, Executive Director

Charles County Government, La Plata, Maryland
The Honorable William D. Mayer, Charles County Commissioner, Board Member of FORVM
Charles Rice, Agricultural Land Use Specialist

Chesapeake Bay Foundation, Annapolis, Maryland
Mr. Will Baker, President
Mr. Michael Heller, Vice President

Delmarva Advisory Council, Salisbury, Maryland
Ms. Dale Maginnis, Executive Director

Delmarva Poultry Industry, Georgetown, Delaware
Mr. Bill Satterfield, Executive Director
Mr. Gerald B. Truitt, Former Executive Director

Direct Farm Market Association, Upperco, Maryland
Mr. Stan Dabkowski, President

FORVM for Rural Maryland, Baltimore, Maryland
Mr. Steve McHenry, Executive Director

Frederick County Office of Economic Development, Frederick, Maryland
Mr. Brian T. Duncan, Executive Director

Harford County Office of Economic Development, Bel Air, Maryland
Mr. C. John Sullivan III, Agricultural Coordinator

Howard County Economic Development Authority, Columbia, Maryland
Mr. Richard W. Story, Executive Director

Maryland Agriculture Commission, Annapolis, Maryland
Mr. Gilbert (Buddy) O. Bowling, Jr., Director

Maryland Agricultural Experiment Station, Wye Research & Education Center, Queenstown, Maryland
Dr. Russell Brimsfield, Director
Dr. Scott Barao, Beef Program Leader
Mr. Michael Newell, Horticulture and Alternative Crops
Mr. Mark Sultanfuss, Field Crops
Galen Dively, Integrated Pest Management

Maryland Agricultural Land Preservation Foundation, Annapolis, Maryland
Mr. Wayne McGinnis, Chair

Maryland Agricultural Statistics Service, USDA, National Agricultural Statistical Service, Annapolis, Maryland
Mr. Ray Garibay, State Statistician
Mr. David Knopf, Deputy State Statistician,

Maryland Agro-Ecology Center, Inc., Queenstown, Maryland
Dr. Russell Brimsfield, Director
Mr. Kevin Miller, Assistant Director

Maryland Apple Promotion Board, Hagerstown, Maryland
Mr. Henry Allenberg, Chair

Maryland Aquaculture Association, Salisbury, Maryland
Dr. Steven Hughes, President

Maryland Cattlemen Association, Sykesville, Maryland
Mr. Dean Considine, President

Maryland Christmas Tree Association, New Windsor, Maryland
Mr. Randy Sisler, President

Maryland Dairy Industry Association, Detour, Maryland
Mr. Myron Wilhide, President
Mr. Paul S. Weller, Jr., Executive Director, Washington, DC

Maryland Farm Bureau, Randallstown, Maryland
Mr. Stephen Weber, President, Board Member of FORVM for Rural Maryland and Maryland Agro-Ecology Center
Ms. Valerie Connelly, Director, Government Affairs

Maryland Farm Service Agency State Committee, Columbia, Maryland
Mr. Thomas Shockley, State Executive Director

Maryland Forest Association, Grantsville, Maryland
Ms. Karin Miller, President
Mr. Calvin D. Lubben, Forester, Smurfit-Stone Container Corporation; past president and current board member

Maryland Grain Producers, Edgewater, Maryland
Mr. Chip Councell, President

Maryland Grape Growers Association, Germantown, Maryland
Mr. Howard Wilson, President
Mr. James Russell, Board member

Maryland Horse Council, Timonium, Maryland
Dr. Malcolm Comer, President

Maryland Nurserymen's Association, Baltimore, Maryland
Mr. Carville Akehurst, President

Maryland Office of Planning, Baltimore, Maryland
Mr. Daniel F. Rosen, Planner
Ms. Deborah Weller, Planner

Maryland Organic Food and Farming Association, Thurmont, Maryland
Mr. Rick Hood, President

Maryland Pork Producers, Edgewater, Maryland
Ms. Jennifer Debnam, President
Ms. Lynne Hoot, Executive Director

Maryland Rural Development Corporation, Annapolis, Maryland
Mr. R. Kevin Brooks, Executive Director, Board Member of FORVM

Maryland Soybean Board, Salisbury, Maryland
Mr. John Saathoff, Chair

Maryland State Department of Agriculture, Annapolis, Maryland
Mr. Hagner R. Mister, Secretary
Mr. Bradley H. Powers, Deputy Secretary
Mr. S. Patrick McMillan, Special Asst. to Secretary/Intergovernmental Relations
Ms. Valerie Gonlin, Program Administrator, Agribusiness Development
Mr. Karl Roscher, Aquaculture Program
Mr. Tony Evans, Domestic Marketing Program, Farmers Markets

Dr. Raymond D. Ediger, DVM, Former State Veterinarian
Dr. Henry Virts, Former Secretary of Agriculture

Maryland State Department of Business & Economic Development, Baltimore, Maryland
Mr. James McClean, Director, Governor's Office of Business Advocacy

Maryland State Grange, Frederick, Maryland
Mr. John Thompson, Master

Maryland Vegetable Growers Association, Clinton, Maryland
Mr. Chris Parker, President

Mid-Atlantic Farm Credit, Westminster, Maryland
Bob Frazee, President & Chief Executive Office
Carl Naugle, Senior Vice President & Chief Lending Officer;
Kenny Bounds, Chief Business Development Officer, DelMarVa, Denton, Maryland

Montgomery County of Department of Economic Development, Derwood, Maryland.
Mr. Jeremy V. Criss, Manager, Agricultural Services Division

Sierra Club, State of Maryland Chapter, College Park
Mr. Christopher Bedford, Chair, Water, Food & Farm Committee

Southern Maryland Tobacco Board, White Plains, Maryland
Mr. Steve Walter, President

Tri-County Council for Southern Maryland, Hughesville, Maryland
Mr. David Jenkins, Executive Director

Annex III. Details of Selected Crop and Livestock Enterprise Budgets

Net incomes for selected farm enterprises in Maryland were estimated using enterprise budgets. Enterprise budgets provide two important kinds of information regarding the production of a specific crop or livestock product. On the one hand, enterprise budgets can be thought of as a recipe, which dictates all the necessary or important ingredients (inputs) to produce a final product (output). On the other hand, enterprise budgets are important financial documents, which provide costs, income and profitability numbers for a specific enterprise. The specific price, input, and output data used in these budgets are overall indicators rather than for a specific farm or region.

Enterprise budgets are usually stated on a production unit size of one acre, in the case of crops, or on a size of production unit in the case of animal production. Each budget has detailed information on output and input prices and quantities. The budgets have four categories of data: (1) Gross Income, (2) Variable Costs, (3) Fixed (overhead) Costs, and (4) Net Income.

Gross income is the quantity produced on a production unit basis (e.g., pounds per acre) multiplied by the expected price per unit (e.g., $ per pound) for state averages in representative years, which may be taken as the average farm's expectation of output and price in the absence of advance information about weather or markets. The production amount for each budget is the level of production that would be expected in Maryland under normal conditions using the specified inputs.

Output prices were taken from two primary sources. For fruit and vegetable products, in-season wholesale prices were collected from the Jessup, Maryland wholesale produce market. These prices represent what local distributors and retailers are paying for produce. These prices are wholesale prices for standard products. Farmers who sell directly to customers or produce specialty products, such as organic products, can expect higher prices. For field crops and livestock products, farm-level prices are published by the Maryland Agricultural Statistics Service. Because of the large variation across years for most agricultural prices, a five-year average price was computed as the price of the output sold.

The second category of data are *variable costs*. Variable costs are outlays for inputs that would not be used if production ceased. These inputs include seed, chemicals, fertilizers, labor and interest on operating capital. The budget provides the input requirement to produce the desired output level under normal growing conditions and good management. These input requirements coincide closely with prescribed management practices for Maryland farming operations. Current prices for variable production inputs such as seed, chemical, and fertilizers, were obtained from local farm suppliers. The prices used here may not be the cheapest because off-season buying or large volume discounts were ignored. Each input's price is assumed to be the same for each enterprise in which that input is used. For example, all crops that require the herbicide Harmony Extra, are assigned the same price.

Fixed costs for equipment are difficult to estimate because the costs differ with size of the equipment and the amount of production. To avoid this problem, we utilize custom rates for various field operations, including planting, hauling, tilling, etc. These rates come from a

custom rate survey of Maryland farmers (Johnson, 2001). Using custom rates provides realistic costs for hiring services, but may overstate costs for those operations that are large enough to obtain lower costs of service by buying and using their own equipment. .

For land costs, even land owned outright with no mortgage has an implicit cost. For example, since cropland could be rented out, there is an opportunity cost of using the land for the farmer's own production. Land costs are measured as the average rental rate in Maryland..

For purposes of this report, University of Maryland extension specialists and county agricultural extension agents evaluated enterprise budgets for which they had knowledge about the production practices. Each specialist examined the budgets and made suggestions for modifications to assure that the inputs used and the amount of inputs recommended were the most advantageous for the region. In addition, based on the input usage recommendations in the budgets, extension specialists provided educated estimates of the expected output that could be achieved under normal growing conditions. Of course, there are a number of different ways to grow specific crops or livestock products. Therefore, the budgets should not be thought of as the best way to produce a particular product on every farm situation, but instead as a production benchmark.

In summary, the budgets estimate costs, revenues, and net income using the best available information on output and input prices, input and output quantities, and machinery and land rental rates. However, these data would vary for different farms, and even for fields within farms. To obtain these cost and returns estimates for a specific situation, data from an actual production situation would need to be substituted for the information used in the budget. In addition, these budgets reflect wholesale marketing. Farmers with retail production and marketing would likely have higher output prices and also higher marketing costs than used in these budgets. Finally, large-scale production units likely would have higher output and lower input prices.

The following tables show only the net income for the enterprises: major field crops in Table A-1, selected vegetable and fruit crops in Table A-2, and selected animals in Table A-3.[29]

Net income for field crops is positive for the major crops, corn and soybeans. Some of the hay crops also have positive net incomes, which is consistent with the hay yield trends discussed earlier. Note that wheat-soybean double cropping is more profitable than single crop soybeans or wheat. Wheat acreage, and perhaps also barley, may be increasing due to the higher profits from double cropping. The double crop enterprise does have lower soybean yields (30 vs. 40 bushels) so that this combination would have less of an advantage with higher soybean prices and may decrease again with higher prices.

[29] Further details are available upon request from the Department of Agricultural and Resource Economics, University of Maryland, College Park.

Table A-1. Net Income per Acre for Field Crops in Maryland, 2001

Crop	Net Income
Barley	-$88.84
Barley – straw and grain	-$48.19
Corn for grain – irrigated	$29.70
Corn for grain	$12.61
Corn – silage	$60.20
Hay – alfalfa	$164.66
Hay – grass	-$51.51
Hay – mixed	$24.53
Sorghum	-$44.30
Soybean	$22.09
Wheat	-$64.26
Wheat – soybean (double crop)	$24.89
Wheat – straw and grain	-$25.00

Source: Department of Agricultural and Resource Economics, University of Maryland, unpublished report, 2002.

Net income for horticultural (vegetable and fruit) crops is largely positive and higher than that for field crops. Recall that the output prices are wholesale so presumably prices and net incomes could even be higher with retail sales. The main reason for these higher profits is the risk of these enterprises. Horticultural crops have a riskier yield because of more susceptibility to insects and disease. Output prices can fluctuate to zero, and output cannot even be sold. In addition, many of these crops require large amounts of hand labor, which can often be hard to find. Producers of these crops must learn to manage these risks.

Net income for the selected animal enterprises in Table A-3 are mostly negative. Unlike dairy and poultry that are not included here, these enterprises are not major commercial products in Maryland. Markets for many of these enterprises do not exist in Maryland, and unless production or marketing conditions change, widespread production of these enterprises as done in the budgets is not promising. These data indicate why so many Maryland producers find the opportunity to grow broilers under contract attractive – the grower can obtain up front a reasonable idea of the returns to labor and investment that can be expected.

Table A-2. Net Income per Acre for Vegetable and Fruit Crops in Maryland, 2001

Crop	Net income
Asparagus	$869.06
Bok choy	$818.10
Broccoli	$172.22
Cabbage	$212.84
Cantaloupe	$1,448.99
Carrots	$387.82
Cauliflower	$658.20
Cucumber	-$147.08
Eggplant	$291.71
Green beans	$191.92
Greens – collard/kale	$270.43
Horseradish	-$259.78
Lettuce	-$192.38
Muskmelon	$435.85
Okra	$184.78
Onion	-$800.00
Peaches	$955.39
Peppers	$90.28
Potato – sweet	$1,077.38
Potato – white	$461.08
Pumpkins	$412.98
Spinach	$447.35
Squash – summer	$301.71
Sweet corn	$396.20
Sweet corn – organic	$23.61
Tomatoes	$1,654.42
Watermelon	$1,151.75

Source: Department of Agricultural and Resource Economics, University of Maryland, Unpublished report, 2002.

Table A-3. Net Income from Selected Animal Enterprises in Maryland, 2001

Enterprise	Unit	Head	Revenue	Net income
Beef finishing	Steer	50	$38,220.00	$93.55
Beef stocker	Steer	50	$24,683.75	$435.30
Beef backgrounding	Steer	50	$24,683.75	-$1,308.24
Rabbit	Doe	100	$14,040.00	-$2,267.87
Sheep–spring lambing	Ewe	50	$7,499.52	$1,810.82
Sheep–winter lambing	Ewe	50	$7,423.52	-$5,835.65
Market lamb	Lamb	100	$9,016.00	$1,061.24
Meat goat	Doe	50	$4,047.52	-$1,245.37
Hog finishing	Hog	100	$9,800.00	-$1,041.30
Cow-calf	Cow	50	$15,131.78	-$9,417.27

Source: Department of Agricultural and Resource Economics, University of Maryland, unpublished report, 2002.

Costs and Returns for Dairy Production

A budget for dairy has not been developed because of large variation in milking systems, land use, and other production inputs. However, we have recently collected a set of cash costs and returns, based on Schedule 1040F, for Maryland dairy farms (Table A-4). These income tax returns are based on cash accounting. Cash returns understate profits for growing firms because increases in assets are not included in gross income, and overstate profits for contracting farms as assets are depreciated and liquidated.

Table A-4. 1996-2000 Average of 33 Maryland Dairy Farms

	Income, Expenses, and Profit per cwt				
	Average 33 Farms	Highest 10 Farms	Lowest 10 Farms	Confinement 23 Farms	Graziers 10 Farms
Average number of cows	102	88	125	107	87
Total cwt milk sold per cow	186	176	193	193	172
Schedule F line					
Farm income					
1 Sales of livestock bought	0.01	0.01	0.01	0.02	0.00
2 Cost or other basis of line 1	0.02	0.00	0.01	0.03	0.00
3 Subtract line 2 from line 1	-0.01	0.01	0.00	-0.01	0.00
4 Sales of farm products					
a. Milk sales	14.41	14.25	14.56	14.40	14.35
b. Crop sales	0.18	0.04	0.41	0.22	0.11
c. Cattle sales	0.77	0.92	0.65	0.65	1.06
5b + 6b + 7 + 8 + 9 + 10	0.77	0.80	0.89	0.69	0.83
11 Gross Income (line 3 to 10)	16.14	16.05	16.51	15.96	16.35
Farm expenses					
12 Car and truck expenses	0.02	0.02	0.01	0.03	0.02
13 Chemicals	0.36	0.12	0.43	0.39	0.29
14 Conservation expenses	0.02	0.02	0.04	0.03	0.00
15 Custom hire	0.37	0.27	0.46	0.35	0.41
16 Depreciation	1.38	1.31	1.44	1.35	1.46
17 Employee benefits	0.03	0.00	0.03	0.03	0.02
18 Feed Purchased	4.27	4.08	4.69	4.45	3.62
19 Fertilizer and lime	0.50	0.39	0.65	0.53	0.45
20 Freight and trucking	0.48	0.35	0.66	0.46	0.54
21 Gasoline, Fuel, and oil	0.28	0.24	0.32	0.27	0.28
22 Insurance (other than health)	0.16	0.17	0.20	0.18	0.10
23a + 23b Interest	0.59	0.56	0.64	0.49	0.77
24 Labor hired	0.74	0.52	0.98	0.87	0.44
25 Pension and profit-sharing	0.00	0.00	0.00	0.00	0.00
26a + 26b Rent or lease	0.90	0.77	0.83	0.80	1.14
27 Repairs and maintenance	1.13	0.86	1.43	1.17	0.98
28 Seeds and plants purchased	0.30	0.29	0.23	0.26	0.42
29 Storage and warehousing	0.01	0.00	0.02	0.01	0.00
30 Supplies purchased	0.72	0.68	0.84	0.69	0.77
31 Taxes	0.10	0.09	0.14	0.12	0.04
32 Utilities	0.33	0.29	0.35	0.33	0.30
33 Vet., breed., and med.	0.66	0.46	0.94	0.72	0.46
34 Other expenses	0.48	0.54	0.36	0.47	0.44
35 Total (lines 12 to 34)	13.81	11.96	15.71	13.96	12.97
36 Farm profit	2.33	4.09	0.80	2.01	3.38

Source: Johnson, 2002

The 33 farms in this analysis had a positive net cash profit of $2.33/ cwt. Profits were even positive for the 10 farms with the lowest profit – $0.80. The ten farms with the highest profits had an average of $4.09. However, this accounting does not include the non-cash costs of owned assets, which are costs of the invested equity, and value of family labor. The value of these assets in dairy production is opportunity costs – what these assets could earn if used in other farm or off-farm investments. Unlike the other budgets in this report, these opportunity costs cannot be based on rental costs of assets because part of the costs of asset rental, such as repairs and taxes, cannot be separated from cash costs. In most of the calculations in this report opportunity costs and cash costs of fixed assets are jointly estimated with rental values for the assets. To adjust these data, opportunity costs of fixed assets are included. These include returns on equity capital and returns on family labor. Adjustments for the average of the 33 farms are in Table A-5.

Table A-5. Average Opportunity Costs and Net Income of 33 Dairy Farms in Maryland, 1996-2000

Cash farm profit	**2.33**
Opportunity Costs of owned assets	
Equity	0.73
Family Labor	
(Consumption Withdrawal)	2.34
Total Opportunity Costs	**3.07**
Farm profits	**-0.74**

Opportunity costs are estimated by using data from the 2000 Pennsylvania Dairy Farm Business Analysis that has 681 participants (Roth and Hyde). The production environment in Pennsylvania is similar to that in Maryland, and the average farm in the Pennsylvania data has 88 cows and 16,117 pounds of milk per cow, which is not much less than in the Maryland data. Thus, the Pennsylvania costs of owned resources should be a relevant estimate for Maryland.

The cost of equity capital was estimated by multiplying the cash interest paid in Maryland and the ratio of average equity to average debt ($242,844/$195,531) in the Pennsylvania records. This estimate is $0.73. This method assumes that the rate of return on equity is the same as on debt. In the Pennsylvania records, the cost of family labor is estimated by withdrawals for consumption of $44,486. Dividing this amount by the hundredweight of milk produced in Maryland gives a family labor cost of $2.34. Family consumption expenditures are often used in farm management to estimate the opportunity cost of labor when its wage is unknown. The average number of unpaid workers for the Pennsylvania farms was 1.48 so the average annual salary per worker was about $30,000. The sum of the costs of equity and family labor or the total opportunity costs is $3.07. Subtracting opportunity costs from cash profits gives profits of $-0.74.

We have less confidence in this profit estimate than for most of the other enterprises in this report. The revenues are not adjusted for changes in inventories and accounts receivable, which would be positive for growing firms. The cost of equity capital is also likely to be as high as the interest rate because the rate of return on equity also has a significant rate of land price

appreciation. Finally, the cost of labor could be overstated if family consumption is partially based on off-farm income. The PA farmers did have an average capital investment of $16,742 from off-farm sources such as off-farm income from jobs or investments, liquidation of off-farm investments, and/or inheritances Net withdrawals are the $44,486 consumption minus the $16,742 or net withdrawals per cwt. of $1.46. Profits are $0.14 when $1.46 is used for consumption per cwt in the above calculations. Dairy production on these 33 farms seems close to the break-even level with these different methods of calculation. However, these farms appear to be viable as the costs of owned resources and purchased inputs are included in these calculations.

The size of the production units in Table A-5 also has some implications for viable dairy farms. Farms with highest profit per cwt have 88 cows with production of 176 cwt per cow. The 10 lowest profit farms have 125 cows and production per cow of 193 cwt. These results are the opposite of usual patterns with larger, more productive farms having higher profitability. The limited land resources in much of central Maryland plus other production conditions do not favor the larger farms in this group of farms. If this holds for the whole industry, dairy production on the smaller farms in Maryland appears to be viable for the future.

One method that smaller dairy farms are competing is to adopt management intensive grazing. This production method involves converting at least some of the cropland to pasture. The cows are rotated frequently as they graze these pastures so that the nutrient value of the grass is enhanced over typical grass. Besides substituting grass for harvested forage, this production system usually reduces or eliminates concentrates from the ration. Some of the producers also have seasonal production which is tied to the grazing season. The 33 Maryland dairies include 10 grazers. While being a small number, they have a cash profits per cwt of $3.38 compared to $2.01 for the confinement producers. Milk production per cow is 172 cwt for grazers compared have milk production of 172 cwt per cow compared to 193 for the confinement dairies. However, this lower production has a lower cost of $12.97 per cwt compared to $13.96 per cwt for the other dairies. The combination of lower production but lower costs account for the higher profits.

Grazing does not fit all farms. Grazing land must be close to the barn or other milking facility and the farmer must have the management skills for this production system, which may involve more management than confinement systems. It does provide an alternative to becoming larger to increase profits that may well become more widely attractive in Maryland.

Costs and Returns for Broilers

An enterprise budget for broilers is included in Table A-6. Annual net income and net cash flow are about $580 and $21,400, respectively, for a 23,600 sq. ft. house. The magnitude of these positive profits compared to most other enterprises indicates why broiler production is so large in Maryland. Net income and cash flow differ substantially because of the large percentage of fixed costs of total costs – about 77 percent. Most of these fixed costs are opportunity costs associated with the house and other investments and family labor.

Growers with no debt have a large cash flow cushion for the main risk in broiler production, which is variation in the number of flocks marketed per year. Both net income and cash flows of those growers with large debt are vulnerable to variations in flock numbers. For example, gross

income and net income fall to $22,656 and $-5949 if the number of flocks per year drops to four due to reduction in total birds required by the processing firm. Cash flows falls to $14,005. Growers without debt therefore still have a large net cash flow. If the debt payment for principal and interest is $15, 000, cash flows will not cover these debt payments even though they would have with 5.5 flocks. While farmers can have similar problems with debt payments from other enterprises, the amount of investments and therefore debt are less for most of these enterprises. Thus, broiler production can present an overall cash flow problem for producers with a large proportion of debt financing. The cash flow calculations in the table omit debt service.

Table A-6. Farm Broiler Production

Sq. ft. of house	23600	Flocks/Year	5.5
Bird density	0.75	Birds/Year	173067
Number of birds/flock	31467		

Item	Unit	Quantity	Price	Total	Cash Flow
Gross income					
Grower payments	1000 Birds	173.067	$180.00	$31,152.00	$31,152.00
Total gross income				$31,152.00	$31,152.00
	Unit	Quantity	Price	Total	Total
Variable costs					
Electricity	Flock	5.5	$545.00	$2,997.50	$2,997.50
Telephone		1.0	$300.00	$300.00	$300.00
Supplies and miscellaneous	House	1	$1,300.00	$1,300.00	$1,300.00
Building & equipment repairs	House	1	$1,500.00	$1,500.00	$1,500.00
Crust out	Flock	5.5	$135.00	$742.50	$742.50
House cleanout	Flock/12	0.4583	$360.00	$165.00	$165.00
Interest on operating capital	1 Month	$7,005.00	9%	$9.55	
Total variable costs listed above				$7,014.55	$7,005.00
Net income over variable costs listed above				$24,137.45	$24,147.00
Fixed costs (do not duplicate costs listed above)					
Owner's labor	Hours/flock	75.0	$8.00	$3,300.00	
Building depreciation	Total	$102,000.00	5.00%	$5,100.00	
Equipment depreciation	Total	$69,500.00	6.67%	$4,635.65	
Interest on investment	Avg. invest	$85,752.00		$7,717.68	
Taxes and insurance	Tot. invest	$180,700.00	1.50%	$2,710.5	$2,710.50
Land charge	Acre	1.50	$60.00	$90.00	
Total fixed cost listed above				$23,553.83	$2,710.50
Total variable and fixed costs listed above				$30,568.38	$9,715.50
Net income over variable and fixed costs listed above				$583.62	$21,436.50

Overall, while the prospects look reasonable for substantial continued production of grains, soybeans, broilers, and dairy in Maryland, potential for expansion is limited. Broilers are the most likely exception but environmental regulations and proximity to urban areas are significant obstacles. Dairy production could expand if larger production units were established. But again, limited land and urbanization is an obstacle. Large-scale production of horticultural products for fresh or processing markets faces severe competition from other areas of the country.

Annex IV. Federal Estate Taxes and Farms in Maryland

An issue in the succession of farms from one generation to the next is the obstacles created by estate taxes. The 2001 Tax Relief Act modified and will eventually eliminate the federal tax. The tax feature of most relevance to farm succession is the Exclusion Amount, which is the maximum size of estate exempt from tax. In 2001, this exclusion is $675 thousand. Estates valued at this amount or lower do not owe estate taxes. For estates larger than this amount, the $675, 000 is exempt from taxes. For example, an estate of $800,000 would only owe taxes on $125,000 (800,000 – 675,000). Married couples can double this amount with minimal tax planning so that $1.3 million can be excluded from taxes in 2001. This exclusion amount increases over time. It becomes $ 1,000,000 for 2002-2003, $1.5 million for 2004-2005, $2 million for 2006-2008, $3.5 million for 2009. Estate tax is completely eliminated in 2010 and is reinstated with an exclusion amount of $1 million in 2011. As the future changes may be modified in later years, let's focus on the amounts for the next five years.

Data on size of estates or distributions of value of farm assets are limited. Census data on the value of land and buildings in Maryland are available. In 1999, ERS estimated that value of all U.S. farm assets was $11.2 billion, and the value of land and buildings was $8.7 billion. Thus, the percent of real estate assets was 77.7 percent, and the value of land and buildings is a good lower bound estimate of value of farms.

Table A-7. Number of Farms by Value of Real Estate in Maryland, 1997

Value of Real Estate ($)	Number of Farms
All Farms	12,109
$500,000 - $999,999	2,112
$1,000,000 - $1,999,999	948
$2,000,000 - $4,999,999	558
$5,000,000 or more	110

Source: Census of Agriculture

Only a small percent of MD farms have a value greater than the future exclusion amounts. Only 1616 farms or about 13 percent of total farms have a value of land and buildings or $1 million or more, and 686 farms or about 6 percent of total farms have a value of $2 million or more. For married couples, very few farms in married are greater than the $2 million of exclusion in 2002 and later. For those farms of that size with unmarried proprietors the percent would be a small percent more until 2004. Neil Harl, an Iowa State University agricultural economic professor, reports that IRS data showed that out of 2.3 million decedents, approximately 47,000 paid federal estate tax in 1998. In only 641 cases did farm property make up half or more of the estate.

These calculations do not take into account other assets owned by farms. On the other hand, the numbers in these categories would be much lower if land was valued for its farm use, which is possible for farms remaining in operation of death of the owner or if debt was owed on the land in the estate.

An estate is eligible for special agricultural valuation if at least 50 percent of the estate is farm real and non-real assets, if at least 25 percent of the assets are farm real estate, and if the

assets must have been used by the deceased or deceased family for five of the eight years before the death. The heirs must use or rent to family members for five year after death. The estate can be reduced up to $750,000 with this special valuation.

Special agricultural valuation is calculated as the five-year average of the county cash rent for land of this soil quality minus the applicable property taxes capitalized by the Farm Credit System real estate loan interest rate. For example, with a cash rent of $55, taxes are $5, and the interest rate is 8.175 percent, agricultural use value $50/.08175 = $611.62 per acre. A 100-acre farm would have a use value $61,162.00 and a market value of $1,800,000 in a rapidly urbanizing county. The difference between these values is $1,738,838. $750,000 of this difference could be deducted from the estate. The value of the land for the estate would be the $750,000 subtracted from the market value, or $1,050,000.

To illustrate potential estate taxes, consider a farm estate of $3 million, where the last remaining owner died in 2002. If the estate is for a single owner or for a married couple who had not done any tax planning, $2 million would be subject to taxes. For 2002, the marginal tax rate on $1.000,001 to $1,250,000 is 41 percent, on $1,250,001 to $1,500,000 is 43 percent, from $1,500,001 to $2,000,000 is 45 percent, from $2,000,001 to $2,500,000 is .0.49 percent, and over $2,500,000 is .0.50. The tax bill is then 0.41($250,000) + 0.43($250,000) + 0.45($500,000) + 0.49($500,000) + .50($500,000), or $930,000. If the estate includes the agricultural land as in the above example, the $750,000 reduction in estate value would lower taxes by $372,500 for a total of $557,500. For couples, who do tax planning, the tax bill is $435,000 without agricultural land valuation. This tax bill is 31 percent in the former case and 14.5 percent in the latter without agricultural valuation. If the heirs wish to maintain ownership, such amounts would have to be financed. In 2004, the taxable estate drops to $1.5 million, the estate tax rate is a flat rate of 45 percent, and the tax is $675,000 for a single person, and zero for a couple. Taxes continue dropping until they are zero in 2009 and 2010 for the single person.

Annex V. Foreign Farmworker Program

Table A-8. H-2A Farmworker Program in Maryland, 2000 and 2001, by Region

	2000		2001	
Region	**Orders**	**Workers**	**Orders**	**Workers**
Western	0	0	0	0
North Central	8	32	10	48
Southern	3	76	5	83
Northern Eastern Shore	5	262	5	257
Southern Eastern Shore	7	47	6	56
Total	23	417	26	444

Source: Maryland Department of Labor, Licensing & Regulation, 2001

Table A-9. H-2A Farmworker Program in Maryland, 2000 and 2001, by Agricultural Sector

	2000		2001	
Sector	**Orders**	**Workers**	**Orders**	**Workers**
Nursery and greenhouse	7	271	8	282
Fruits	1	4	0	0
Vegetables	10	128	11	129
Grain	0	0	1	10
Livestock	3	6	2	4
Other	2	8	4	19
Total	23	417	26	444

Source: Maryland Department of Labor, Licensing & Regulation, 2001

As a base case, assume that all poultry litter is currently applied as a crop nutrient source within the county that the poultry is produced. Implementation of the nutrient management requirements limits the amount of poultry litter that can be used in any given county and, thus, requires some poultry litter to be put to alternative uses. The most profitable alternative use to in-county land application is transportation for land application outside the county of production. A small amount of poultry litter may be used in other operations such as compost production. As mentioned earlier, alternative uses such as energy production, pelletization for land application out-of-county, and application to forest lands are being assessed in an alternative study nearing completion.

To estimate the quantities of poultry litter that could be absorbed by in-county crop production, information on the total number of acres currently receiving poultry litter is combined with estimates of acreage restrictions under the WQIA to determine the amount of excess poultry litter (that amount which can no longer be used for in-county land application). Soil test data from the University of Maryland's Soil Testing Lab are used to estimate the number of acres of cropland with excessive levels of phosphorus.[30] Assuming that nitrogen-based nutrient management plans will be required for all land with soil phosphorus test values below some pre-set maximum, and that for land above this level, the addition of phosphorus will not be allowed. The final regulations require the application of a phosphorus index on lands above the pre-set soil phosphorus test level. Application of the phosphorus index will allow some amount of land above this level to apply phosphorus. Estimates of the amount of land with various levels of phosphorus have recently been released and will be used in the alternative uses project mentioned earlier. The assumptions used in this analysis lead to over-estimates of the amount of land for which no phosphorus, and thus no poultry litter, will be allowed. Therefore, this analysis may overestimate the economic impacts of the nutrient management requirements.

The first step in estimating the expected quantities of excess poultry litter is to estimate how many acres of in-county cropland will be eligible to receive poultry litter. This is combined with information on the amount of poultry litter produced in each county to estimate the amount of litter that could be used for in-county land application. This number is adjusted to account for the fact that not every crop grower will want to choose poultry litter over commercial fertilizers. For the Lower Shore, it is assumed that 20 percent of the eligible crop acreage will not use poultry litter, this number is increased to 40 percent for all other Maryland counties.

The amount of poultry litter that must find an out-of-county alternative use is equal to the amount produced, less the amount that retains its base case use, less the amount that finds an alternative in-county use.

How will the regulations change the value of poultry litter? The change in value of poultry litter is the combination of the changes in value for local land application and the change in value for application out-of-county. These two changes are estimated separately and then combined to get a net impact.

[30] There is concern that the University of Maryland's Laboratory tests represent a proportionately high number of soils receiving animal manures and, therefore, this data may overestimate the percentage of acres in each county with high levels of phosphorus. Thus, this analysis may overestimate the impacts of the WQIA.

The changes in economic value of poultry litter will vary depending upon current costs for land application of poultry litter. The current costs depend upon whether poultry growers use their own poultry litter or whether the poultry litter is transported to another in-county crop grower for land application. Currently, 36 percent of poultry growers use their own poultry litter on their own or on rented land, while 64 percent sell, give away, or pay to dispose of poultry litter (Michel, 1996).

The use of some poultry litter for in-county land application is still allowed. For poultry litter currently being used by the poultry grower, the change in value of the poultry litter is the loss in fertilizer savings from no longer using poultry litter as a nutrient source (calculated at the current average rate of litter application in the base case), plus the costs of marketing the poultry litter, plus the costs of loading the poultry litter for transport, plus the costs of transporting the poultry litter to another in-county farm, less the gain in fertilizer savings from using the poultry litter as a nutrient source on the other farm (calculated at the rate recommended by a nutrient management plan).

The net change in value for in-county use of poultry litter for poultry litter that is currently being moved off farm is the same as for poultry litter currently used on-farm except there are no additional loading or transportation costs.

To calculate the change in value of poultry litter transported out of county for land application we use a least cost travel model to distribute poultry litter to available lands in neighboring counties. This model only looks at counties in Maryland. Thus, poultry litter is shipped to the upper Shore counties, Southern Maryland, and Central Maryland. As with the in-county land application, it is assumed that 40 percent of the available land not on the lower shore will not use poultry litter.

The net changes in costs for out-of-county land application are the net changes in costs for in-county land application, plus the losses in fertilizer savings from the litter that is no longer used in-county (calculated at the average rate of application), plus the costs to market the litter, plus the costs to load the litter, plus the costs to transport the litter, less the gains in fertilizer savings from out-of-county land application (calculated at the nutrient management application rate).

In both in-county and out-of-county land application, the increased costs of transporting poultry litter to more distant crop land is partially offset by the additional nutrient value received by better management of the nutrients in the poultry litter.

Annex VII. Small Farms in Maryland

Small farms have different meaning for many people. While the mythical self-sufficient farm of earlier history is often the interest of discussions of small farms, the low-income or the rich urban transplanted owners of acreages are modern images. The size that constitutes a small farm also varies. These popular conceptions suggest that small farms are heterogeneous. In this report, we utilize the definitions recently utilized by USDA-ERS. While they are somewhat arbitrary, they provide a basis for discussion.

Small farms are those that have sales of $100,000 or less. Such a definition is superior to one based on acres of land because different numbers of acres are required for different enterprises. For example, a farm with 100 acres of corn would meet this definition while one with 100 acres of fresh vegetables would not. Four categories are:

- Limited resource farms that also have assets less than $150,000 and total household income less than $20,000
- Farming occupation with low sales
- Residential-Lifestyle farms with an off-farm occupation
- Retirement farms, whose owners report that they are retired

Note that limited resource farms can have characteristics similar to the other categories; the low-income and limited assets combined with low farm sales defines this category.

It is useful to consider the differences in small farms by the degree of urbanization. For this comparison, three groups of counties are defined for Maryland, using the same criteria as in the text of the Report. The *Central Metropolitan* counties have the largest population and include Baltimore, Howard, Montgomery, Anne Arundel, and Prince George's. The *Other Metropolitan* counties include Allegany, Allegany, Carroll, Frederick, Harford, Washington, Calvert, Charles, Cecil, and Queen Anne's. *Non-Metropolitan* counties are Garrett, St. Mary's, Dorchester, Somerset, Wicomico, Worchester, Talbot, Caroline, and Kent.

Numbers of farms with selected characteristics that are related to the above small farm categories are presented in Table A-10. As the number of farms in each category varies due to non-responses on some questions our discussion focuses on the percentages. The number of small farms is high in all three regions, being 89 percent in Large Metro, 80 percent in Other Metro, and 62 percent in non-metro. While the majority of farmers are small in all regions, the two Metro categories are higher. This high percentage of small farms exists in many areas of the country. Based on survey data, the Economic Research Service in the USDA reports that 62 percent of U.S. farms are defined as limited resource, residential, and retired farms. Another 20 percent report a farming occupation but have sales less than $100,000.

Table A-10. Classifications of Farms in Maryland by County Groups, 1997

Classification	Group of Counties					
	Large Metropolitan		Other Metropolitan		Non-Metropolitan	
	1992 Percent of Farms	1997 Percent of Farms	1992 Percent of Farms	1997 Percent of Farms	1992 Percent of Farms	1997 Percent of Farms
Occupation						
Farming	64	44	62	51	58	58
Other	36	56	38	49	42	42
Age Group						
65 and over	30	27	26	24	980	23
Size of Farm						
Small	90	89	97	80	63	62
Large	10	11	3	20	37	38
Hours Worked Off Farm						
None	29	0	29	2	0	26
Zero to 100	25	52	25	50	56	30
100 to 200	20	27	20	27	25	25
More than 200	27	21	26	22	19	19

Table A-10 also has Information on Maryland residential and retirement farms. The criterion for the retirement category is the operator being of age 65 and over. Occupation proxies the residential category. The pattern among the regions is the same as for the age variable. The majority is non-farmers in the Large Metro counties in 1997, but the majority is farmers in the other regions. Hours worked off the farm collaborate these data.

The necessary data to determine what percent of retired and non-farmers have small farms were unavailable for this report. In the U.S. data, none of the retired farmers and only 2.4 percent of the residential farms have sales greater than $100,000. The sum of the retired and residential variables percentages are less than the percentages of small farms so some whose occupation is farming are among the small farms. One can not determine how many of these are limited resource farms because some may have the assets, net farm income, or family off-farm income to not be limited resource farmers.

The large number of small, retired, and residential farms in the metro areas indicates a different type of agriculture than the traditional commercial farms. Small farms produce only 17 percent of the agricultural output in the United States and 10.6 percent of output in Maryland. However, small farms do produce a larger percent of certain commodities. As shown in Table A-11, small farms produce more than half the total tobacco and forage crops and about 40 percent of. cattle and calves. Other field crops range from 17 to 27 percent while hogs and other livestock, which is largely horses, are around 20 percent. Small farms produce less than 10 percent of poultry, green house and nursery, and dairy, which are the three largest agricultural

commodities. Production of these commodities on small farms is limited by the capital and labor requirements for efficient production of these compared to the other commodities. While many of the field crops require large investments in machinery, custom hire can substitute for ownership to limit capital investment.

Table A-11. Maryland Sales by Commodity and Farm Size, 1997

Commodity	Large Farms		Small Farms	
	1000 $	%	1000 $	%
Corn for Grain	80,889	82.9	16,741	17.1
Wheat	26,034	78.8	7,019	21.2
Soybeans	82,157	81.7	18,422	18.3
Grain Sorghum	1,483	73.4	538	26.6
Barley	4,597	80.2	1,137	19.8
Tobacco	3,381	25.1	10,065	74.9
Hay, Silage, and Field Seeds	5,558	34.8	10,391	65.2
Vegetables	33,649	80.7	8,030	19.3
Fruits, Nuts, and Berries	10,297	84.7	1,856	15.3
Nursery and Greenhouse	108,869	90.7	11,138	9.3
Poultry	562,338	98.8	6,649	1.2
Dairy	140,356	92.0	12,196	8.0
Cattle and calves	35,700	62.5	21,417	37.5
Hogs	11,155	79.5	2,871	20.5
Other Livestock	30,019	80.8	7,137	19.2

These data have several implications. If small farms continue to grow, commodities produced by small farms should receive more emphasis from agribusiness and policy makers. A similar point was made in the discussion of sales to urban consumers. In addition, expansion of the three large commercial commodities on small farms could be emphasized. More research on the organization of small producers of these three commodities may suggest educational and policy innovations to encourage small farm production. For example, a combination government and industry grant and loan program may allow expansion of broiler production on small farms. Further study of all small farms may reveal educational and policy opportunities for small farms.

The other issue about small farms is that they continue to provide open space. Open space is a key attribute of farms in urban parts of Maryland. While agricultural production is an important part of the economy in some regions of the state, other economic activity would have to become more important if the number of small farms were to grow. If this point is valid, farmland preservation and other programs to maintain farms should not emphasize only large farms.

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