The Changing Role of Agriculture in Montana's Economy: 1965 – 2005

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Introduction

Agriculture, along with mining and forestry, has been the cornerstone of Montana's economy from the very beginnings of the state's history as a part of the United States. Between 1864 and 1889, when Montana was still a territory, cattle were an important driving force in the advent of settlers, especially in the late 1860s and 1870s. The development of the railroads in the 1880s then created new opportunities for wheat and small grains farming as well as cattle and sheep operations. Throughout the 20th century, ranching and farming remained the mainstay of local economies in many Montana counties, although with a changing emphasis in the mix of commodities and the relative importance of the agricultural sector in the state's economy. In addition, changes in the mix of land, labor, machinery and equipment used to produce agricultural commodities have resulted in increases in the size of farms and ranches for which agriculture is the principle source of family incomes. These shifts in agricultural resource uses have contributed to population declines in many counties in eastern Montana, where local communities have not benefit from growth in other sectors of their economies.

Within the state as a whole, historically agriculture has been critical to the economic wellbeing of almost all Montana residents. When agricultural incomes have been high, state and local government tax revenues have generally been healthy and provided funds for expanded public services, including education, roads, and other forms of infrastructure. Moreover, consumer expenditures and purchases of agricultural business services have generally been higher when agricultural incomes have been high, increasing economic activity throughout the service sectors of the state's economy. In contrast, during hard agricultural times, government tax revenues have generally been

anemic, restricting the ability of state and local government to supply public services and causing consumer expenditures and agricultural business service activities to fall, leading to harder economic times for the entire state. Although agriculture's relative importance in the state-wide economy has moderated over the past forty years, it continues to be important for the state as a whole and the major determinant of the economic performance of many highly rural counties.

In the context of Montana's environment and the state's natural resource base, agriculture has an equally important role. Decisions by ranchers and farmers about land use often have important consequences for the state's ecology and wild life. For example, participation by farmers in the federal Conservation Reserve program (CRP) since 1985, when the program was created, substantially increased the availability of nesting habitat for upland game birds (pheasants and sharptail grouse) and prairie nesting ducks. These large tracts of grassland habitat have made a major contribution to increased populations of these species. Mule deer have benefited in some locations, coyotes have replaced red fox as the major carnivore and nest success rates are much higher for ground nesting birds as a result of this change**.** Another important issue has involved the interface between the use of land for agricultural production and access to public lands and streams for hunting, fishing and other recreational activities. The patchwork nature of public lands means that, in some cases, access can only be obtained by crossing private lands, creating the potential for conflict between agricultural producers and users seeking to use public lands for other purposes.

This chapter examines the changes that have taken place in Montana agriculture over the past forty years and their implications for land use and the state's economy. The

chapter is organized as follows. We begin by providing an overview of agriculture in Montana and describe how agriculture and its role in the state's economy have evolved over the past forty years. Next we examine the changing structure of farm and ranches in terms of their size, the way in which agricultural producers organize their businesses and economic lives, and the extent to which farming has remained a family business. We then examine how land use by farmers and ranchers has changed, the forces that have induced those changes, and their effects on farm and ranch incomes and land use. These vectors for change include the role of markets and commodity prices, economy-wide forces such as rising real wages in the non-agriculture sector that have encouraged labor saving technical innovation in agriculture, federal agricultural commodity programs, federal environmental policies, and international trade agreements. We then consider what the future may hold for Montana' agriculture, land use and economy in light of potential developments in the forces for change for Montana agriculture. Finally, the wheat and livestock sectors of Montana's agricultural industry are major sources of farm and ranch incomes. The evolution of these two sectors over the past forty years is therefore described in two Appendices to this chapter.

Agriculture in Montana

In stark comparison to most states, Montana specializes in the production of relatively few major commodities.[2] Farm and ranch activities revolve around three main

[2] In states such as California, Florida, Michigan, Iowa, and North Carolina, the agricultural sector is highly diverse and farmers receive substantial incomes from horticultural products, as well as a more diverse mix of row crops and livestock enterprises that include commodities such as cotton, soybeans, corn, dairy cattle, hogs, and poultry, in addition to wheat, barley and beef cattle. Some Great Plains states such as North Dakota, South Dakota and Minnesota also have more diversified agricultural sectors that include soybeans, corn and other oilseeds in their row crops and somewhat more extensive hog and dairy operations.

enterprises: the production of beef cattle, wheat and barley. Wheat and feed barley are typically produced on land that is not irrigated, usually called dryland. Malt barely, an important cash crop for some farms along the Yellowstone and Little Big Horn rivers and north of Great Falls in what is known as the Golden Triangle area, is produced on both irrigated land and dryland. Most ranches focus on cow calf operations and receive the majority of their income from the sale of calves that are born in the spring and marketed to feedlots in the following November or December. Many ranches raise hay, barley and corn for silage to provide winter feed for their herds. In the spring, summer and fall, they graze their animals on state and federal lands as well as on their own and other private pasture and grazing areas.

The extent to which wheat, barley, and cattle are currently the dominant sources of farm and ranch incomes is demonstrated by the fact that typically they account for just over 80 percent of total farm and ranch cash receipts from sales of crops and livestock. Figure 1 shows state-wide cash receipts in 2004 from sales of crops and livestock, providing a snapshot of the relative importance of different agricultural enterprises today. In 2004, agricultural producers in Montana obtained 25.3 percent of their cash receipts from sales of wheat, 5.6 percent from barley, and 49.3 percent from cattle and calves. Among other agricultural commodities, only hay (3.9 percent) accounted for more than three percent of total cash receipts.[3] Sheep, lambs and wool, for example, accounted for only 1.1 percent and dairy products for 2.38 percent of total cash receipts from sales. Apart from sugar beets, which provided 2.5 percent of total cash receipts, no other crop accounted for more than one percent of the value of total agricultural commodity sales in

[3] In fact, hay's importance is understated by its contribution to cash receipts because a large proportion of hay production in Montana is directly fed to livestock on the farms and ranches on which it is produced and is not sold to other producers.

2004. These other crops include minor oilseeds such as canola, safflower, sunflower and flax, legume crops such as peas and lentils, and fruits and vegetables such as cherries. Fruits and vegetables are important sources of income for a few agricultural producers but, with the exception of seed potatoes in some counties, are very minor sources of total farm and ranch household incomes in Montana.

In this respect, Montana's agriculture today is quite similar to Montana's agriculture in the mid 1960s and early 1970s. In 1970, for example, wheat and barley together accounted for about 30 percent and beef cattle for about 45 percent of the value of total farm and ranch cash receipts (gross income) from the production of commodities.[4] Since then, there has been only a modest degree of diversification among crops in Montana. Over the past dozen years, for example, some acreage has been moved into the production of minor oilseeds and legumes such as peas and lentils, but these crops are still not major contributors to most farm and ranch incomes. In addition, some farm operations have been successful in raising and marketing organic crops, but in Montana these also remain niche commodities produced for highly specialized markets by only a few producers.

Sources of Montana Farm and Ranch Incomes

Figures 2 (a), 2(b), and 3 provide a long term perspective on the evolution of Montana's agricultural economy in terms of total cash receipts from all sources of agricultural incomes and the relative importance of livestock (mainly cattle), crops

[4] Information on cash receipts from sales by commodity are not available on an annual basis from USDA prior to 1993. Thus, exact comparisons of the relative importance of each commodity in 1970 and 2004 cannot be made. However, information is available of the contribution of major categories of product (for example, food grains and meat animals). Therefore the above comparisons are reasonable.

(mainly wheat and barley), and government programs that provide direct revenues or government payments to farmers and ranchers. Figures 2(a) and 2(b) show the total dollar value of annual cash receipts from livestock, crops and government payments in terms of nominal or current dollars (figure 2(a)) and inflation adjusted or real dollars (figure 2(b)). In figure 2(b), receipts for all years have been adjusted to show their values in terms of the purchasing power of the dollar in 2000. Figure 3 shows the percentage of total cash receipts from each revenue category in each year.

In nominal terms (current year dollars) Montana agricultural producers' total cash receipts from all sources of revenue increased five fold from 0.47 billion dollars in 1965 to 2.52 billion dollars in 2005. However, over this period, the general level of prices in the economy also experienced approximately a five fold increase. Thus, as figure 2(b) shows, in terms of inflation-adjusted or real dollars, total cash receipts received by farmers have exhibited no long run trends. In terms of nominal dollars, between 1965 and 2005 total cash income from the sale of livestock products rose from 0.24 billion dollars to 1.28 billion dollars, total cash income from the sale of crops rose from 0.18 billion dollars to 0.96 billion dollars, and government payments increased from 0.05 billion dollars to 0.28 billion dollars. In inflation-adjusted terms, however, the purchasing power of these receipts has changed relatively little.

Revenues from the sale of livestock and crops

While, in inflation-adjusted terms, total cash receipts from all three major sources of farm and ranch income have exhibited no long run trends, although they have increased in nominal terms, each income source has also exhibited a considerable degree of variability. In nominal (and real) terms, market receipts for livestock are closely

linked to livestock product prices. In 1986, for example, when cattle prices were at near record lows, livestock sales generated 598 million dollars. One year earlier, in 1985, cattle prices were much higher and livestock sales generated 806 million dollars, over 30 percent more than in 1986. Revenues from crop sales are affected both by crop prices and by crop yields. When wheat prices are high and growing conditions good, cash receipts from the sale of crops are relatively large. In 1996, for example, when these conditions were met, farmers grossed 1,241 million dollars from crop sales. In contrast, in 2001, when world wheat prices were at near record lows and drought conditions prevailed in many areas of Montana, state-wide revenues from crop sales were only 643.1 million dollars.

Government Payments

Government payments have also been volatile. However, year-to-year changes in government payments have tended to offset changes in crop revenues. This has occurred because some important federal farm programs are structured to provide crop producers with larger subsidies when crop prices and/or crop yields are low.[5] In 2001, for example, when state-wide revenues from crop sales were at a fifteen year low, government payments to Montana farmers amounted to almost 500 million dollars, a forty year high, and represented 22 percent of total farm and ranch cash receipts. In contrast, in 1996, when state-wide revenues from crops sales were at a 40 year high, government payments amounted to only 240 million dollars and accounted for less than 10 percent of total farm cash receipts.

[5] A standard text-book explanation of the rationale for farm programs is that they have two main objectives: to increase average farm and ranch incomes and to stabilize those incomes by reducing the year to year variability that occurs because of production and price risks.

Between 2000 and 2005, a period marked by several years of severe drought, government payments provided Montana farmers and ranchers with an average of 16.4 percent of their total cash incomes. This proportion is somewhat lower than it was in the mid 1980's and early 1990s, but higher than between 1965 and 1983. The key elements of federal farm programs for Montana agricultural producers are the major commodity programs, federal crop insurance, and the Conservation Reserve Program (CRP). Most of these programs are likely to be renewed in 2007, when Congress is scheduled to develop and pass a new farm bill, although some levels of support may be adjusted.

Federal Commodity Programs

The major commodity programs currently provide subsidies for wheat, barely, oats, corn, minor oilseed and pulse crops (peas and lentils).[6] They have three major components. Farms that have a long history of producing wheat, barely, oats and corn are eligible for **direct payments** which are based on their past history with those crops, but not on current production. The same farms are also eligible for **countercyclical payments**, which are made when prices for those crops are low. These two programs are relative new comers in the U.S. pantheon of agricultural policies. Direct payments were introduced in the 1996 Farm Bill (often called Freedom to Farm), and the countercyclical payments program was established by the 2002 Farm Bill. Producers of all of these crops and, in addition, minor oilseeds and pulse crops, may also participate in a price support program under which they can receive subsidies for the crops they actually produce when market prices are low. The price support programs, introduced in the 1930s, are now called marketing loan programs and most of the subsidies provided under these programs

[6] The major commodity programs also provide subsidies for soybean, rice, and cotton producers, but these crops are not raised commercially in Montana.

are called loan deficiency payments. Farmers may only participate in the major commodity programs if they comply with several federal requirements about their production practices that generally are intended to reduce soil erosion and maintain or improve water quality.

Federal Crop Insurance Programs

Federal crop insurance programs have also been an important source of income and income stability for Montana farmers and ranchers, providing indemnities for losses when adverse growing conditions have caused crop yields to be low, forage stands to be poor, and/or commodity prices to be low. Federal crop insurance programs, originally proposed by Franklin Roosevelt during his 1936 presidential campaign, provide farmers with yield and revenue insurance policies that result in indemnities when yields are low (yield insurance) or per acre revenues are low because of either low yields or low prices or some combination of both (revenue insurance). Yield insurance has been available for major Montana crops for several decades, revenue insurance has been offered since the mid 1990s, and forage insurance has only been available since 2004. Yet all three types of insurance products are currently widely used in Montana. This is partly because, since the passage of the Agricultural Risk Protection Act in 2000, the government has provided subsidies that pay approximately 60 percent of most agricultural producers' premiums for these policies.

Conservation Reserve Program

The Conservation Reserve Program (CRP), introduced in 1985, has also been an important source of farm and ranch incomes and, as discussed below, has been widely utilized by Montana's agricultural producers. It is a voluntary program under which farmers can choose to sign a contract to place a specific area of cropland into a conserving use for a fixed multiyear term, typically for ten years, during which time the cropland cannot be planted to crops. In addition, CRP land cannot be used for livestock pasture or grazing unless explicit approval is provided for that use by USDA. Such approval is typically given only when a county is experiencing severe forage shortfalls because of drought.

From the perspective of farmers and ranchers, the CRP is a land retirement in which they participate only if they believe it is beneficial for them to do so. Thus the CRP is viewed favorably by many farmers and ranchers. Conservation and environmental groups also generally support the CRP because they believe the program provides important environmental benefits in the form of reduced soil erosion, increased plant diversity (as farmers are required to use native grasses as cover), and expanded wildlife habitat.

Montana Agriculture's Contribution to the State's Economy

Montana has relied heavily on agriculture as one of its six core economic sectors, along with mining, oil and gas, tourism, manufacturing, and federal government activities.[7] Agriculture is unique in that standard measures of agriculture's relative

[7] Typically, a core sector is located in a state because of the state's resource base and the structure of transportation costs or federal government activities. For example, the steel industry continues to be a part of Pennsylvania's core economy because of the state's deposits of iron ore and coal and relatively lower transportation costs for steel and steel products than for iron ore and coal. In any state, some sectors are

importance to the state, such as its share of Gross State Product (GSP), are generally viewed as inadequate.[8] A more useful measure of the relative importance of agriculture and its changing role in Montana's economy is the ratio of total farm and ranch cash receipts to gross state product.

Data on Montana's GSP and the ratio of total farm and ranch cash receipts to state GSP are presented in Figure 4. In nominal terms, Montana's GSP has increased steadily over the past 40 years, rising from 2.17 billion dollars in 1965 to 29.85 billion dollars in 2005. A substantial part of this fourteen fold increase in Montana's GSP is attributable to economy wide inflation as the general level of prices in 2004 was over five times higher than in 1965. Nevertheless, in real or inflation adjusted terms, Montana's GSP in 2004 was still about 2.7 times higher than in 1965. Thus, real economic output in the state increased by about 270 percent over that forty year period.

In nominal terms, the value of economic activity in Montana's agricultural sector, as measured by total cash receipts, also increased substantially between 1965 and 2004 (see Figure 2a) but not at the same rate as Montana's GSP. In fact, as discussed above, in inflation-adjusted terms, total cash receipts received by farms and ranches remained relatively stable over that periods (see Figure 2b). As a result, the ratio of total farm and ranch cash receipts to GSP declined from 22 percent in 1965 to nine percent in 2004.

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clearly a part of the economy's core while whether or not other sectors belong in the core is more ambiguous. Here, the sectors identified as part of Montana's core all meet the above core criteria. Other more ambiguous sectors such as information technology related industries are not included.

[8] Gross state product (GSP), measured and reported by the U.S. Bureau of Economic Analysis for each state as part of the national income accounts, is the market value of all goods and service produced in the state. As such, the GSP for Montana is the primary indicator of overall economic activity in the state. Net farm income or value added by the agricultural production sector is widely viewed as a problematic indicator of economic activity in agriculture because it is measured a residual (the measure is the difference between difference between reported total farm and ranch incomes and reported farm and ranch expenditures on inputs). Year-to-year expenditures in inputs, including capital outlays, are highly volatile and are widely viewed as overestimated because of tax-related incentives to maximize reported expenditures. In addition, net farm income fails to account for on farm consumption of agricultural commodities.

Most of this decline occurred between 1975 and 2004. Nevertheless, agriculture remains a critically important core component of Montana's economy and with a much larger role than it enjoys in the nation's economy.[9]

Agriculture's relative decline in relation to state-wide economic activity is largely attributable to more rapid growth in Montana's service sectors such as health care, retailing, and financial institutions. Its contribution to Montana's economic core has remained much more substantial. One measure of this contribution is agriculture's share of the proportion of all workers employed in the core sectors of Montana's economy. Data on employment in these sectors are presented in Table 1 for the period 2001 to 2004. In 2004, for example, a total of 98,000 people were employed in mining (including oil and natural gas extraction), agriculture, forestry, logging and fishing, manufacturing, tourism and federal government, of which 31,785 or 32.4 percent of the total were employed in agriculture. Similar proportions of the total work force for these sectors were also employed in 2001, 2002 and 2003.

Like other core sectors of Montana's economy, agriculture's impact extends beyond its immediate effects on farm and ranch households who depend directly on the production of agricultural commodities for their incomes. Agricultural businesses in Montana that provide "up-stream" input supply services and "downstream" transportation, processing, and marketing services are also affected by how the sector performs. Beyond agribusinesses, the economic wellbeing of service sectors such as banking, wholesaling, retailing and the legal profession are also influenced by the economic performance of the agricultural sector. Thus some argue that, as reflected by

[9] The ratio of the value of total cash receipts received by all U.S. farms and ranches to the nation's gross domestic product is approximately two percent, as compared to nine percent in Montana.

the proportion of core sector workers employed in agriculture, approximately 30 percent of all economic activity in Montana is linked to the state's agricultural sector, even though agriculture's share of Montana's gross state product is about nine percent.

The Organization of Montana Farms and Ranches

Montana farms and ranches come in many shapes and sizes and vary with respect to the way in which their businesses are legally organized. Questions have been raised about the extent to which large scale farming is replacing smaller scale operations. An implicit assumption behind these concerns is that small farms are family farms, large farms are corporate farms (that is, farms owned by "impersonal" corporations), and any trend towards large farms means that family farms are being driven out of existence. Agricultural census data indicate that this is not the case, not least because farms with corporate structures are not typically owned by corporations but by families who have incorporated their operations, often for tax reasons and to mitigate financial risks. The first issue, however, is what has been happening to the number of farms and farm size in Montana.

Number and Size of Farms

When asked about trends in the number and average size of farms in the state, many Montanans respond that they believe the number of farms has fallen and that, on average, farms are larger with respect to geographic area (numbers of acres) and value of sales. In fact, according to data from the USDA Agricultural Census, today Montana has considerably more farms than in 1982 and the average area operated by each farm size has declined. However, the Agricultural Census data also show that today a substantially larger proportion of agricultural cash receipts is accounted for by large farms than in the

early 1980s. In addition, in the state's eastern counties, farm size has generally increased, contributing to population declines in those areas.

Farm and ranch size can be measured in several ways. The two most commonly used measures are geographic area (the number of acres in a farm or ranch) and value of sales of agricultural products.[10] Data obtained from the U.S. Census of Agriculture on the number of ranches in Montana and their distribution by farmland acres are presented in Table 2 for the period 1982 to 2002.

In contrast to conventional wisdom, the data from the Census show that the total number of farms and ranches in Montana increased by 18.2 percent from 23,570 to 27,870 operations over that twenty-year period. The size of the average farm also decreased from 2,568 acres in 1982 to 2,139 in 2002. However, these simple averages should be viewed with considerable caution. In 1982, the 4,244 small farms and ranches with less than 50 acres represented 17.9 percent of all farm and ranch operations. In 2002, that number had grown by about 50 percent to 6,486 and small farms and ranches with less than 50 acres represented 23.3 percent of all farm and ranch operations.

The more than fifty percent increase in the number of these small operations accounted for about half of the increase in total farm and ranch numbers in the state and was closely associated with the development of small scale farm and ranches, often called ranchettes, in 20 acre or smaller subdivisions in counties like Gallatin and Missoula, and in the Flathead valley. Most of the owners of these small scale operations have jobs other than farming or ranching as their primary occupation. In comparison, the numbers of farms in the two largest categories – farms with between 1,000 and 2,000 acres and farm

[10] A third measure is gross farm income from market sales, government payments, land rents, and other agriculture-related sources of income. This measure results in a very similar picture to the picture provided by examining farm size in terms of value of market sales.

with 2,000 acres or more – have decreased, although only very modestly. However, among the largest farms (operations with 2000 acres or more) average farm size has tended to increase.

Data on the distribution of the number of farms by value of sales categories are presented in Table 3. Table 4 shows the total value of sales by all farms in each of these categories. Taken together, these data provide a useful picture of the extent to which the concentration of farm and ranch economic activity among large farms changed between 1982 and 2002. In 1982, there were 19,287 very small or relatively small farms and ranches with market sales of less than 100,000 dollars per year, representing 81.9 percent of all farms and ranches in Montana. Those farms also accounted for 32.5 percent of the total market value of agricultural commodities produced in the state. In 2002, farms and ranches with sales of less than 100,000 dollars per year still represented 81.9 percent of all farms and ranches in Montana but produced only 16.4 percent of the total market value of all commodities produced in the state. Thus, in 2002, the two largest categories of farms which constituted 18.1 percent of all producers accounted for 83.4 percent of the value of the state's agricultural output. Twenty years earlier, the largest 18 percent of Montana's farms accounted for only 67.5 percent of the state's agricultural output. This substantial change in the relative commercial importance of large farms has raised questions about whether Montana agriculture is still about family farm operations.

The Structure and Organization of Montana Farms and Ranches

Historically, farms and ranches in Montana have been managed by families, not by corporate employees. This continues to be the case, perhaps especially for larger farms and ranches that also predominantly serve as the primary sources of income for the

families who operate them. Thus larger operations are more likely to be traditional full time family farm businesses than smaller operations.

The data presented in Table 5 on the proportion of farm and ranch operators in 1997 and 2002 who reported agriculture as their primary occupation provide useful insights about this issue. Among farm and ranch operations with annual market sales of less than 10,000 dollars, operations in the three smallest farm size categories, less than 50 percent of operators described farming as their primary occupation. In contrast, among the three largest categories of farms and ranches, operations with annual market sales of more than $100,000, over 90 percent of all operators described farming as their primary occupation.

The hypothesis that larger farms are more likely to be family farms is also supported by the information presented in Table 6 on the business structure of farms in Montana in which farms are classified by four types of business structure: individual or family farms (essentially, sole proprietorships), partnerships, corporations, and other forms of organizations such as trusts. Between 1982 and 2002, rapid growth occurred in the individual or family farm category, where the number of operations increased by 19.1 percent from 18,842 to 22,448. The number of partnerships remained relatively stable, increasing only by about five percent from 2,099 in 1982 to 2,192 in 2002. Over the same period, the number of corporations increased by 16.9 percent from 2,336 in 1982 to 2,730 in 2002, a somewhat lower proportional increase than for individual or family owned farms. Other types of organization increased from 293 operations to 500 operations, a large percentage increase, but from a small base.

Proportionally, over the entire twenty year period, individual or family operations continued to constitute about 80 percent of all farms. Partnerships became proportionally less important with their share of total farm and ranch operations declining from 8.9 percent to 7.9 percent. Corporations maintained their share of total farm operations at almost 10 percent, and other forms of organization became more common but sill accounted for less than 2 percent of all farm and ranch operations in 2002.

The importance of the family farm is understated by the data presented in Table 6. Other surveys have shown that almost all farm and ranch partnerships and a majority of farm and ranch corporations are in fact owned and operated by families and not large conglomerate corporations. In 1997, for example, data from the USDA National Agricultural Statistical Service indicated that 98 percent of all farms and ranches in Montana were family operations.

Sources of Change in the Structure of Farms and Ranches

If it is still the case that almost all farms are family operations, then why have large farms become more important? One important factor, perhaps the major driving force, has been that wages and incomes outside of agriculture have been increasing since 1982, just as they have throughout the past 150 years. Higher wages outside of agriculture have led to rising labor costs within agriculture, as agriculture has had to compete with other sectors to retain a work force. Over the long term, farm and ranch operators have therefore sought to restructure their operations to improve the returns to the labor they use on the farm. This has led many operations to increase the amount of machinery and equipment with which they farm or ranch each acre of land and agricultural suppliers to develop labor saving equipment and technology.

Thus, in Montana, as in other states, farming in the first decade of the 21st century has become one of the most capital intensive industries in the U.S. economy and farms have increased the commercial scale of their activities. In addition, large operations, with full-time or near full-time farmers and ranchers, have expanded the number of acres they farm to obtain economies of scale in the use of larger machinery and equipment.

Many smaller operations have moved to arrangements through which they either share or lease the equipment they need or hire custom operators to apply chemicals, plant and harvest crops, and transport their products to market. The operators of many of these smaller farms and ranches then allocate much of their time to off-farm employment, and, even in Montana, farming or ranching is often an agricultural producer's second job rather than his or her primary occupation.

Land Use by Montana Farms and Ranches

Almost a third of the land in Montana is owned by federal, state and local governments, and the management of that land is largely determined by public policies. Nevertheless, a large proportion of public land is leased to farms that produce crops and to farms and ranches for spring, summer and fall grazing of cattle and, in some cases, sheep. In Montana, lease revenues from public lands owned by local governments are important sources of funding for primary and secondary education programs.[11] Detailed data on the use of both public and private lands by farms and ranches is provided once every five years by the U.S. Census of Agriculture. These data are presented in Figure 4 for the years 1982, 1987, 1992, 1997 and 2002.

[11] Royalty and lease revenues from mining and oil and gas exploration are also important in some Montana school districts such as Colstrip.

Pasture, Grazing and Cropland Use

The data presented in Figure 4 show that the total amount of land in Montana farms and ranches has been relatively stable over the past twenty or so years ranging from a high of 60.54 million acres in 1982 to a low of 58.44 million acres in 1997. Over the entire period, the amount of cropland in the state has steadily risen from 16.45 million acres in 1982 to 18.35 million acres in 2002, an increase over the 20 years of approximately 11.6 percent. In contrast, the area allocated to pasture and grazing has fluctuated between a low of 37.19 million acres in 1997 and a high of 40.81 million acres in 1982, and consisted of 38.24 million acres in 2002, about 6.3 percent lower than in 1982. In summary, a modest increase in total cropland has been largely offset by an approximately similar decrease in pasture and grazing land. Other uses of farm land, which include woodland (some of which is also grazed) and land allocated to housing plots and used for ponds, have varied to some extent over the period, ranging from a high of 3.28 million acres in 1982 to a low of 2.82 million acres in 1987. However, in absolute terms, these changes have been modest, and total land allocated to these other uses has remained relatively stable and close to its 2002 level of 3.02 million acres.

Among these three general categories of land use, as is shown in Figure 5, the proportion of total land allocated to cropland over the twenty year period 1982-2002 increased from 27.2 percent to 31.2 percent while the proportion of land allocated for pasture and grazing declined from 67.4 percent to 64.1 percent. The share allocated to other uses has remained constant at about five percent. This reallocation of land between crops on the one hand and pasture and grazing on the other has been partly driven by the steady expansion of federal crop insurance programs and crop insurance subsidies since

the Carter administration's 1980 Crop Insurance Reform Act. Incentives for moving pasture land into cropland and subsequently into federal conservation programs such as the Conservation Reserve Program (CRP), which was initiated in 1985 and for which only cropland is eligible, may also have influenced the reallocation of land between pasture and crop categories.

Cropland Allocation by Use

Cropland itself has multiple uses. In any given year, some cropland is planted to crops and harvested; some is grazed or used for pasture; some is left fallow to replenish moisture and soil nutrients; and some is idled in the CRP, other voluntary federal land retirement programs, or for other reasons. Figure 6 and Figure 7 show the allocation of cropland among these different uses in terms of total cropland acres (Figure 6) and shares of each use in those acres (Figure 7). Total cropland in Montana has increased over the past twenty years by about 11 percent, as discussed above. The area planted to crops has varied from year to year, ranging from 8.76 million acres in 1992 to 9.9 million acres in 1997 but has exhibited no obvious long trend. Fall and spring moisture conditions have been a major determinant of the area planted to crops, especially winter wheat (planted in September for harvesting in the following summer) and hard red spring wheat and durum (planted in March or April for harvesting in late July, August or early September of the same year). In addition, farmers' expectations about harvest-time market prices, often based on futures prices for harvest-time sales at the time they plant their crops, have had important effects.

The area left fallow in any given year (summer fallow) decreased from 5.39 million acres or 33 percent of total cropland in 1982 to 3.47 million acres or 19 percent of

total cropland in 2002. One reason for this decline has been the introduction and adoption of the practice of chemical fallow, which has improved the efficiency with which soil moisture is used. Another important factor has been the improvement in the efficiency and subsequent widespread adoption of air seed drills for planting in the 1990's, which has enhanced soil moisture retention and reduced the resources needed for seed bed preparation.

The Role of the CRP

The most substantial change in the use of cropland in Montana has been the enrollment of cropland acres in the CRP. The CRP, as discussed above, is a voluntary land conservation program that was introduced in 1985. The total amount of Montana's cropland enrolled in the CRP increased from zero in 1982 (prior to the inception of the program) to 3.53 million acres or 19.2 percent of total cropland in 2002. The program has been well-received by most farmers, but several rural communities, especially in Eastern Montana where the majority of the state's CRP acres are located, have expressed serious concerns about the effects of the CRP on their local economies.[12] In many cases, entire farms have been placed in the CRP, resulting in population loss. Further, in most counties, the demand for agricultural business services from machinery and equipment suppliers, agricultural chemical dealers, and other farm input providers has been lower than would otherwise have been the case. On the other hand, the CRP has increased the profitability of many farm and ranch operations by providing agricultural producers with higher net returns from land that was only marginally profitable when cropped. Thus,

[12] Under USDA's rules for the CRP, only a maximum of 25 percent of a county's eligible cropland acres can be enrolled in the program. In several eastern Montana counties, such as Daniels and Sheridan this maximum has been attained and USDA's constraint on the proportion of cropland that can be enrolled in the CRP is binding.

over the past twenty years, the CRP has increased the personal incomes and consumer expenditures of many farm households and stimulated retail sales within the state.

Cropland and Crop Production

Figure 8 shows how planted cropland has been allocated among major crops between 1965 and 2005.

Spring and Winter Wheat

Wheat has consistently been the most important crop in Montana. The area planted to winter and spring wheat has ranged from a low of 3.38 million acres in 1970 to a high of 6.35 million acres in 1996. It is worth noting that, at time of planting, wheat futures prices for harvest-time sales were at near record lows in 1970 and at near record highs in 1996. In fact, the area planted to wheat in Montana steadily increased until the mid 1990s but then declined somewhat in the late 1990s as wheat prices fell. The area planted to wheat then contracted even further between 1999 and 2004, a multi-year period in which most Montana wheat producing areas experienced severe drought conditions.

Barley

Barley has been the second most important annually planted crop in terms of planted area, although the area harvested for alfalfa and other forms of hay has generally exceeded the area planted to barley. The area planted to barely has ranged from a high of 2.4 million acres in 1987 to a low of 0.9 million acres in 2005. The decline in total barley acreage since the mid 1980s has been the result of a substantial reduction in the area planted to feed barley and is linked closely to policy innovations in the 1990 and 1996

federal Farm Bills. Prior to 1990, farmers were required to maintain base acres for each crop on their farm in order to receive certain types of federal government subsidies. These base acreages were maintained by planting the actual crop on those acres.[13]

The 1990 Farm Bill allowed farmers to plant up to ten percent of their base acres for a given crop without losing any of the subsidy for which they were eligible.[14] The 1996 Farm Bill essentially abolished the program and replaced it with the set of subsidies that are now called direct payments, which farmers receive whether or not they plant the crop to which the payments were previously tied. Feed barley had steadily become a less profitable crop in the 1980s, partly because of generally lower prices for all feed grains and partly because feed barley yields had not increased as rapidly as wheat yields. Once farmers in Montana (and elsewhere) were given the flexibility to receive direct payments without planting barley on what had previously been their barley base acres, they reduced their production of barley.

Durum Wheat and Oats

Among other annually planted crops, the area planted to durum wheat has fluctuated between 1965 and 1995 but remained relatively stable at about 0.35 million acres. Since 1995, however, the area planted to durum wheat has expanded and 0.59 million acres were planted to the crop in 2005. In contrast, the area planted to oats has consistently declined over the past forty years, decreasing from a high of 780 thousand acres in 1970 to a low of 90 thousand acres in 2005.

[13] There were some important wrinkles in the base acres program. In some cases, farmers could avoid actually planting a crop by accepting a reduction in the subsidy payments for which they were eligible, but most farmers found it more profitable to obtain the subsidy by raising the crop.

[14] The provisions of the 1990 Farm Bill allowed farmers to reallocate up to an additional ten percent of their base area to other crops but only if they gave up the subsidy associated with the area planted to those other crops.

Sugar Beets

Sugar beet acreage has remained relatively stable over the entire forty year period. Between 1985 and 2005, the area planted to sugar beets ranged from 43 thousand acres to about 61 thousand acres, averaged about 53 thousand acres, and exhibited no upward or downward trend. This is not surprising. Sugar beets are raised under a quota system in which processing plants have market allotments that are allocated to individual producers. Changes in planted area generally occurred only in response to changes in these market allotments.

Alternative Crops

Many agricultural producers have expressed interest in alternative crops since 1996, when that year's Farm Bill increased their flexibility with respect to crop planting decisions. Peas and lentils, minor oilseed crops such as canola, flax and safflower, and chickpeas have all been considered. However, data on the area planted to most of these crops in Montana have only become available since the late 1990s. Figure 9 shows the distribution by crop of the total area in Montana planted to crops in 2005. As in most previous years, wheat (including durum wheat) accounted for over 50 percent (54.5 percent) of total planted cropland. Hay was harvested on 30.6 percent and barley on 9.2 percent of total planted cropland. All other crops accounted for only 5.7 percent of planted cropland. Among the minor crops, peas and lentils were the most important, accounting for 2.9 percent of total planted cropland, while minor oilseeds (canola, flax and safflower) were raised on only one percent of total planted cropland.

The above information provides an interesting picture of Montana's crop agriculture. Over the past forty years, wheat has been the primary field crop and it

continues to play a dominant role. Feed barley and oats have become much less important, while crops such as sugar beets, oilseeds, and legumes like peas and lentils play a minor role in the overall agricultural economy. This does not mean that these minor crops are unimportant sources of income for some individual farm households. It does imply that their contribution to Montana farm incomes and the Montana economy is on average relatively modest.

Forces for Change in Montana Agriculture

Over the past four decades, agriculture in Montana has been a dynamic industry in which agricultural producers have responded to changing economic opportunities to ensure that their farms and ranches remain sustainable over the long run. Several forces have played major roles in shaping the current structure of Montana's agriculture. From an economist's perspective, these forces are the usual suspects and likely to be the prime forces for change in the future.

1. Commodity Prices

Commodity prices have played a central role in determining farm production decisions. For example, the Montana sheep industry's rapid decline, which is discussed in detail in Appendix 2, was closely tied to the steady and large declines in wool and lamb prices over the past forty years. Areas planted to different varieties of wheat have also been closely linked to movements in wheat variety prices, as shown in Appendix 2.

2. Farm Policy

Farm policy has also been important. In 1982, for example, the CRP did not exist and no cropland was enrolled in the program. In 2002, 19 percent of Montana's cropland

was placed in conserving uses through farm participation in the CRP. Interest in alternative crops such as minor oilseeds and legume crops did not become widespread until passage of the 1996 Farm Bill. In addition, it is unlikely that sugar beets would be raised anywhere in Montana if the current federal sugar program did not exist. This program restricts sugar imports from other countries and, in most years, raises domestic sugar prices well above world price levels.

3. *Agricultural research and development*

Agricultural research and development has led to new mechanical and biological technologies that have changed Montana agriculture. One reason why sheep have left many Montana pastures and cattle have not is that genetic research and new biotechnologies have enabled beef cattle producers to improve the size and quality of the animals they raise and obtain economic returns from those improvements. Part of the explanation for the decline in feed barley production is that plant breeders have been more successful in improving wheat yields than barley yields since the beginning of the 1980s. Some producers are now raising corn on irrigated land in the Yellowstone Valley because researchers have developed new corn varieties that can be raised in a shorter growing season.

4. Farm Management Skills

Farm operators have consistently improved their skills and knowledge through education; that is, today more farmers and ranchers in Montana have some college education or college degrees than ever before. This improvement in their human capital has on average enabled farm operators to make better management decisions.

5. Agronomic Conditions

Agronomic conditions have dictated many farm and ranch management decisions. In periods of extended drought, for example, farmers have been more likely to plant spring wheat than winter wheat and to fallow land.

6. Geography and Climate

Montana's geography and climate matter and explain much of what agricultural producers in Montana do and, just as importantly, what they and Montana agribusinesses do not do. One reason why two thirds of land in Montana farms and ranches is used for pasture or grazing is that the land's soil and topology are not good enough and/or precipitation is not sufficient to allow it to be used to raise crops. Many people wonder why food processing is not a major component of Montana's manufacturing sector and feed lots are not a common phenomenon. The answer is geography. Montana has no major population base and is geographically isolated. Whether processing will occur near to the production of a raw commodity depends heavily on the costs of transporting the raw commodity relative to the costs of transporting the processed commodity. From a transportation cost perspective, it is cheaper to move food grains from Montana to California, the Mid-West, and the East Coast, where lots of consumers live, and process the grains into cereals there. Processed food grains tend to be packaged in ways that increase the space and cost needed to ship them (just think of that box of Wheaties on your pantry shelf).

In contrast, feed lots tend to be located close to areas where feed grains are produced because it is cheaper to ship the animals to the feed grains they require than to ship those feed grains to the animals. Each pound of weight gain for a beef calf requires that the calf consume approximately five pounds of feed grains (that is, corn and barely).

So it is much cheaper to ship a calf to the corn than the corn to a calf. While Montana farmers raise some feed barley and a little corn, the state is a feed deficit region; that is ranchers and the few feed lots that do exist in Montana typically have to acquire some of the feed they need from other states. Thus most Montana cattle ranches are cow-calf operations that ship calves to feed lots in eastern Colorado, Nebraska and Kansas, all of which are feed surplus areas and, not insignificantly, a third or more of the way towards the beef's final destination on Mid-West and East Coast dinner tables.

Changes in the above six factors have led to important changes in Montana agriculture over the past forty years. What happens to these factors over the next decade will also affect the structure of agriculture in Montana. So it is useful to explore how and why they may change in the context of the following issues: the implications of agricultural biotechnology and other research programs, longer run climate change, the potential evolution of international or global agricultural commodity markets, and international trade agreements and potential changes in U.S. domestic agricultural policies.

Agricultural biotechnology and other agricultural research

In inflation adjusted or real terms, agricultural commodities are cheaper today than they were four decades ago, and much less expensive than they were in the early 1900s. This is one of the great accomplishment of American and global agriculture. Less expensive food has improved the quality and standard of living for literally billions of people around the world. In Montana, for example, in 1950, the average yield of an

acre planted to wheat was about 18 bushels. In 2005, the average yield of an acre of wheat was about 36 bushels, a 100 percent increase. Much of that increase can be attributed to agricultural research, including the development of new varieties, improved agricultural machinery, the development of more effective chemical herbicides and pesticides, and improved management practices. Lower prices for agricultural commodities have also resulted from technical and infrastructure improvements that have lowered transportation costs from the farm gate to the supermarket.

Agricultural research is likely to continue to lower production costs for crops by improving crop varieties both in terms of yields and quality attributes, increasing crop resistance to disease, pests and adverse weather conditions, and developing more efficient agricultural machinery and equipment. Research on animal disease, animal genetics, optimal feeds and feed mixes, grazing practices, and forage production is likely to improve livestock production and quality. However, research and development investments, especially investment that flow from the private sector, are likely to be concentrated in commodities that are currently most economically important because innovations in those areas have the highest economic payoffs. Thus it is likely that most research resources will be allocated to beef cattle, wheat and barley research in Montana. However, nationally, considerable research resources from the private and public sector are currently being invested in major crops such as corn, soybeans and cotton. Spillover benefits from these research programs, especially corn and soybeans, may accrue to Montana producers as new varieties of corn and soybeans are developed that have shorter growing seasons and better resistance to adverse weather conditions.

The use of biomass as a renewable energy source is also of considerable interest in Montana, as well as almost all major crop producing states across the nation. Technologies have been developed over the past thirty years to produce ethanol from corn, and to crush oil seeds for biodiesel fuels. Montana and many other farm belt states have developed subsidy programs to facilitate the construction of plants to convert biomass into fuel. The federal government has also provided subsidies for such processing facilities. Future increases in the demand for crops for the production of fuel, however, are heavily contingent on what will happen to the price of crude oil and, by implication, the prices of diesel, gasoline, and natural gas. Most studies suggest that if the price of a barrel of oil exceeds 70 or 80 dollars, then ethanol and other biomass fuels will be cost competitive. However, if the per barrel price of oil is less than 60 dollars, then ethanol and other biomass fuels will not be economically competitive sources of energy unless substantial subsidies are provided to the biomass fuel industry.

If the price of oil were to remain much above $70 to $80 per barrel then the implications for Montana agriculture would be as follows. The demand in the United States (and globally) for crops such as corn, soybeans, and minor oil seeds that are most efficiently converted to biomass fuels would increase quite substantially. Prices for these commodities would then increase to some extent and the price of feed barley, an alternative to corn in animal feed rations, would also likely increase. Montana farmers would likely shift some of their cropland into the production of minor oilseeds and barley and Montana livestock producers would face higher feed grain prices. If the price of oil remained much below 60 dollars per barrel, then, given current biomass conversion

technology and absent large government subsidies for biomass fuel production, it seems unlikely that there would be any substantial implications for Montana agriculture.

Climate Change and Montana Agriculture

Global warming is a controversial issue both with respect to the scientific findings about the extent and rate at which it is occurring and the consequences for precipitation and temperature in different parts of the world. However, there is a broad consensus that global warming is taking place and, from the perspective of climatologists, at a fairly rapid pace, resulting in a one to two degree increase in global temperatures over the next 80 to 100 years. Thus, relatively little change is expected to occur over the next five to ten years. Hence the impact of climate change on agriculture in Montana is likely to be very modest or negligible in the medium term. To the extent there is an impact over the next decade, global warming may result in a slightly longer growing season. That expansion could facilitate the expansion of corn acreage on irrigated land and reduce the risk of crop loss due to early frost in some parts of the state. The effects of global warming on precipitation in Montana are not entirely clear. If Montana were to become measurably drier, then dryland yields would fall for all crops and average forage production would also decline. If Montana were to become wetter, then yields for all crops would rise, forage production would increase, and farmers could conceivably introduce new crops such as soybeans. Over the next decade, it seems unlikely that global warming will have any substantial effects on Montana's climate. Moreover, from an economic perspective, eighty to a hundred years is a long time, and from that perspective climate changes associated with global warming will occur slowly. Montana

farmers and ranchers, therefore, will probably be able to implement incremental and gradual adjustments rather much more costly abrupt and rapid changes in their production practices crop mixes, and livestock enterprises.

Global Markets and Montana Agricultural

The prices received by Montana's farmers and ranchers for most of the commodities they produce are in large part determined by global and national market forces. For example, wheat and feed barley prices at the local elevator are closely linked to wheat prices on the major grain exchanges in Kansas City (the Kansas City Board of Trade), Minneapolis (the Minneapolis Grain Exchange) and Chicago (the Chicago Board of Trade). Prices for cattle in Montana are closely linked to cattle prices on the Chicago Mercantile Exchange that are largely determined by world and U.S. market conditions. The extent to which prices for wheat depend on world market conditions is illustrated by the fact that over the past forty years the U.S. wheat industry exported between 40 and 50 percent of the total U.S. wheat crop. Beef cattle prices are also closely linked to world markets. Between 1998 and 2003, for example, U.S. beef producers exported approximately eight percent of total U.S. beef supplies. The loss of access to those export markets in 2004 and 2005 that resulted from the December 23, 2004 discovery of a "mad cow" disease case in the U.S. has been estimated to have reduced U.S. and Montana fed cattle and feeder cattle or calf prices by about 6 percent.

Global Wheat Markets

The prospects for increased world export demand for wheat are confused. China is both a major producer of wheat (in 2003 and 2004 China's production of wheat

exceeded wheat production in the U.S. by over 40 percent) and the world's largest consumer of wheat. Between 1996 and 2002, China was essentially self sufficient with respect to wheat; that is, it produced about the amount of wheat it consumed. Beginning in 2003, however, China's production of wheat declined as biotechnological innovations improved its ability to raise other crops such as cotton. In addition, increases in per capita incomes increased both demand for and the domestic prices of fruits, vegetables, fish, pork, lamb and beef, reallocating land resources to the production of these commodities and feed grains. These long run developments are likely to turn China into a net importer of wheat over the next decade and to stimulate world wheat export demand and world wheat prices. However, developments in the wheat industries of Russia and the Ukraine also matter. In both countries, the underlying trend has been for wheat production to increase and exports from those countries have tended to expand over the last three years. Improvements in these countries' grain handling infrastructures and the wheat varieties available to their wheat farmers are likely to continue this process. In addition, wheat production in Australia and Argentina, both long time net exporters of wheat, has also increased over the past fifteen years and exports from these countries have been trending upwards. The net effects of all of these changes is unclear, but it is difficult to argue that there will be either a substantial strengthening or weakening of world wheat prices over the next five to ten years.

Global Beef Markets

The impact of world market developments on the U.S. beef industry is likely to be somewhat different. Since December 2003, concerns about the BSE case identified in the state of Washington have restricted the access of U.S. beef exports to foreign markets.

However, widespread access to those markets is likely to be reestablished over the next one or two years. Most assessments of the global beef market suggest that world demand for beef is likely to increase substantially over the next decade. Per capita incomes in countries such as China, Vietnam, Brazil and the transition economies of some central European countries have been increasing and are likely to continue to increase rapidly. In other countries such as Mexico, per capita incomes are simply likely to begin to increase. In addition, in several of these countries, population growth is likely to expand. Beef demand is positively associated with increasing per capita incomes and population growth in these countries. It is likely, therefore, that global beef demand will increase over the next decade.

These affects may be mitigated by decreases in demand in developed countries associated with demographic changes. Individuals in their twenties and thirties are the largest consumers of beef. As populations in countries like the U.S. become older, cohorts in the twenty-to-forty age-group are likely to decline, and per capita beef consumption to moderate. However, the net effects of all of these developments are likely to be positive, and beef and cattle prices may strengthen over the next decade.

Other Commodities

Many other commodities produced by Montana's farmers and ranchers are also traded on international markets. These include minor oilseeds such as canola, safflower and mustard seed and legumes such as dry peas, lentils and chickpeas. In each case, the U.S. is currently both a small consumer and a small producer in the commodity's global market. For many of these commodities, therefore, prices will be determined by market developments in other countries, mainly in the Indian sub-continent (for example, India,

Pakistan, and Bangladesh) and the Pacific Rim (for example, Thailand, Vietnam, and China). Global demand for many of these crops is likely to increase as these countries experience economic growth, rising per capita incomes and population growth. However, global production is also likely to expand as farmers in many of those countries adopt improved farming technologies and access to improved seed technologies. Thus it is difficult to make any substantive assessment of future developments in the prices of those commodities.

International Trade Agreements and their Implications for Domestic U.S. Agricultural Policies and Montana Agriculture

Over the past twenty years, both globally and within the United States, agriculture has become an increasing focus of a series of international trade negotiations and international trade agreements that have important market access and domestic policy implications for Montana farmers and ranchers. These include the following agreements and negotiations.

1. CUSTA. In 1989, the U.S. signed the Canada – United States Free Trade Agreement (CUSTA) under the terms of which tariff and some other barriers to agricultural trade between the two counties were reduced or abolished.

2. NAFTA. The tripartite North American Free Trade Agreement (NAFTA), which essentially extended the agricultural provisions of CUSTA between Canada and the United States to Mexico, came into effect in 1994.

3. GATT and the WTO. Also in 1994, a new General Agreement on Tariffs and Trade (GATT) was signed by over 130 counties at the conclusion of what was called the

Uruguay Round of GATT negotiations. The 1994 GATT, which also established the World Trade Organization (WTO), was the first to explicitly include provisions intended to reduce barriers to trade, export subsidies, domestic subsidies for agricultural products that distorted world agricultural commodity markets, and restrictions on trade based on spurious assertions about threats to human, animal and plant health (the phytosanitary and sanitary agreement).

4. CAFTA. The 2005 Central American Free Trade Agreement (CAFTA) lowered barriers to trade in some agricultural commodities between the U.S. and several Central American countries (initially Costa Rica, the Dominican Republic, El Salvador, Honduras, and Nicaragua and, in 2006, Guatemala).

5. Other Agreements and Negotiations. Other free trade initiatives are being developed between the U.S. and Australia and the Bush administration has been an advocate for a Free Trade Area of the Americas (FTAA).

The 1994 GATT had some important substantive consequences for the structure of U.S. farm programs as they were amended by the 1996 Farm Bill. In the 1996 Farm Bill, as discussed above, a new direct payments program was introduced that removed a major link between subsidies received by farmers and incentives for the production of specific crops by removing the requirement that the crops to which the subsidies were previously tied had to be planted. This decoupling, which removed some policy incentives for the production of major agricultural commodities such as wheat, corn and soybeans, was perceived to be permissible under the 1994 GATT. In addition, the 1996 Farm Bill effectively ended the United States' target export subsidy program for

agricultural commodities, called the export enhancement program (EEP), by removing funding for it. Both of these changes reduced incentives for farmers in Montana to produce wheat, barley and oats.

Currently, a new round of multilateral WTO trade negotiations called the Doha Round is taking place, again with agriculture as a major focus of the discussions. One broad objective for many countries in these negotiations is a reduction in the domestic subsidies provided by the United States and the European Union to their agricultural producers. In addition, as a result of a complaint filed by Brazil against U.S. domestic programs for cotton, in 2005 an independent WTO dispute resolution panel found that several key elements of U.S. farm programs as they had been applied to cotton were in violation of the commitments the U.S. made when it signed the 1994 GATT. These included the cotton loan rate/deficiency payment, countercyclical, and direct payments programs as well as a cotton export subsidy program called Step 2. Apart from the Step 2 program, which applied only cotton, similar programs are operated for wheat and other major row crops that are widely supported by Montana agricultural producers. The validity of these programs has also been called into question by the WTO panel's findings in the cotton case.

However, in June of 2006, the Doha round of GATT negotiations entered a period of apparent dormancy. No agreement had been reached about reductions in domestic subsidies which, in the case of the United States, could potentially imply reductions in subsidies provided under U.S. loan rate/price support programs, possible reductions in subsidies for federal crops insurance programs, changes or even a discontinuation of countercylclical payments, and modifications to federal direct payments programs. These

reductions would directly lower the average returns to Montana farmers from producing wheat, barley, oats, minor oilseeds, and some pulse crops and reduce incentives for their production. An additional area of negotiation in the Doha Round concerns government export credit guarantee programs and food aid programs, both of which are used quite extensively by the United States to market or distribute wheat to low income countries and could be substantially modified if a new WTO agreement is eventually negotiated.

The above discussion has been focused on challenges created by trade agreements and the WTO for U.S. and Montana farmers. However, the main objective of multilateral and other trade negotiations is to enable exporters to obtain improved access to markets for their products in other countries. The United States, and in particular Montana, is a net exporter of agricultural commodities. A major goal for the U.S. in the Doha Round is to lower tariffs and other trade barriers on agricultural commodities, including wheat and beef. The one thing a new Doha Round Agreement appeared likely to accomplish was some reduction in agricultural import tariffs and non-tariff barriers, which are extremely large in countries like South Korea, Japan and China, major actual or potential markets for Montana wheat and beef.

One controversial issue in the negotiations leading to the 2005 CAFTA was the U.S. sugar program which relies on restrictions on sugar imports to ensure higher domestic prices. Several of the countries that signed CAFTA are net exporters of sugar. The U.S. sugar program was also the subject of considerable debate in the Uruguay Round negotiations that led to the 1994 GATT. The outcome was that neither CAFTA nor the 1994 GATT required any major changes in the U.S. sugar program. It seems unlikely that the Doha Round will result in provisions that vitiate that program. Thus, at

least over the next five to ten years, sugar beet production appears likely to continue at current levels in the Yellowstone and Little Big Horn valleys (between 50 to 60 thousand acres of sugar beets planted each year).

Summary

Agriculture in Montana has evolved continuously since the mid 1960s. Production technologies have changed as new crop varieties, improved agricultural machinery, more effective pesticides and herbicides, new genetic information, and innovative herd management practices have become available though agricultural research and development. Changes in market prices for agricultural commodities, changes in federal farm programs, and differences in the rate of technical change among individual crop and livestock enterprises have also altered the economic returns from different enterprises.

These shifts in relative returns have generated important changes in the mix of crops and livestock enterprises. Notably, farmers now allocate much less land to the production of feed barley and oats than in the 1960s and early 1970s, ranchers graze far fewer sheep on their pasture and rangeland, and dairy enterprises are much less common than they were forty years ago.

In addition, in response to the increased flexibility in planting options provided by the 1996 Farm Bill and the expansion of some federal subsidy programs to minor oilseeds and pulse crops, agricultural producers have become more willing to produce commodities such as canola, mustard seed, flax, safflower, dry peas and lentil, although

these crops still provide only a small proportion of total cash receipts received by farms and ranches.

Further, over the past twenty years, in response to the federal Conservation Reserve Program, farms and ranches have placed approximately 19 percent of Montana's cropland into conserving uses. The result has been a substantial increase in wildlife populations in some counties in the state.

However, in several important respects, the pattern of Montana's agriculture changed very little over the last twenty to forty years. The total area in farms and ranches has remained relatively constant at about 60 million acres, of which approximately two thirds is pasture and grazing land and one third is cropland. Total cropland has actually increased moderately since the early 1980s and, correspondingly, the area used for pasture and grazing land declined a little.

Some aspects of the use of cropland have changed, but others have not. The total area planted to crops increased between 1982 and 2002, notwithstanding the shift of 19 percent of total cropland into the CRP, but only by a proportionally small amount. However, the area of cropland annually left fallow declined by almost 40 percent over the same period.

This shift is at least partly attributable to the adoption of new farming techniques and technologies such as chemical fallow and air seeders that improve soil moisture retention. These innovations have enabled many farmers to shift from two year fallow rotations to three fallow year rotations in which land is fallowed every third year, not every other year.

The allocation of planted cropland between different enterprises has changed in some ways, as discussed above, but in most important respects is very similar to the way in which it was allocated in the mid 1960s. Wheat accounts for over half and hay for about thirty percent of all planted cropland. Sugar beets and potatoes remain modest users of cropland and areas planted to those crops have changed very little over the past twenty to thirty years.

In terms of total cash incomes received from the sale of agricultural commodities by farms and ranches, from a proportional perspective again not much has changed over the years. The sale of beef cattle provides about 45 percent and the sale of wheat about 30 percent of Montana's total annual farm and ranch market receipts. However, government subsidies are currently proportionally a more important source of farm and ranch total cash incomes than they were in the 1980s, and this has been the case since the mid 1990s.

Another facet of agriculture that has not altered over the past forty years is its role in Montana's core economy. While agriculture's importance relative to all economic activity in Montana (as measured by the ratio of total farm and ranch cash receipts to Montana's Gross State Product) has steadily declined since the mid 1970s, that decline is largely attributable to the expansion of service industries such as the retail and finance sectors.

Among the six basic industries – agriculture, forestry and wood products, oil and gas exploration, mining, tourism, and federal government operations – agriculture's share of total employment by these core sectors and other measures of its economic contributions indicate that it persistently directly accounts for about 30 percent of core

economic activity and, through linkages among core and service sectors, about 30 percent of all economic activity in the state.

The structure of Montana farms has also changed in some ways. Perhaps surprisingly, the total number of farms in Montana increased substantially between 1982 and 2002 and, in terms of area, average farm size declined modestly.

However, many of the new farms were very small operations and most were less than 50 acres in size. In fact, from an economic perspective, the evidence suggests that commercial activity became more concentrated among large farms between the early 1980s and 2002.

In terms of value of sales, the largest 19 percent of Montana's farms and ranches received 81.9 percent of the value of total sales of agricultural commodities in 2002, a substantial increase over the 67.5 percent they received in 1982. Some have suggested that this shift implies the demise of the family farm.

This does not appear to be the case. Over 90 percent of the operators of large farms in Montana describe farming or ranching as their primary occupation, and data from the 1997 Agricultural Census indicate that 98 percent of all farms and ranches in the state, including the largest farms, are owned by families, not conglomerate corporations. In fact, less than 50 percent of owner-operators of small farms of less than 100 acres in Montana describe farming as their primary occupation, indicating that, for many of those individuals, agriculture is their secondary occupation.

Finally, change in Montana's agriculture has been driven by shifts in agricultural commodity prices, changes in federal agricultural policies, the development of new technologies through agricultural research, improvements in management skills,

agronomic conditions, and climate. Events that affect these factors will determine the future of Montana's agriculture, as they have in its past. These are likely to include developments in global and national markets that affect commodity price, international trade agreements that condition policy change and access for U.S. agricultural exports to markets in other markets, agricultural research and, perhaps, climate change driven by global warming.

The extent to which these events alter the landscape of agriculture in Montana depends on the degree to which they change economic returns from different agricultural enterprises. However, regardless of what these events might be, wheat and beef will almost surely remain the dominant components of Montana's agricultural economy over the next decade and the foreseeable future.

The bottom line is that the allocation of agricultural land in Montana between rangeland and cropland is unlikely to change substantially over the next several decades. Moreover, while some modest changes in the use of crop land may occur, unless the federal Conservation Reserve Program is changed or abandoned, no major adjustments in the allocation of that cropland among alternative uses seem likely to be on the horizon.

Table 1. Total Employment in Montana's Core Economic Sectors: 2001-2004

	2001	2002	2003	2004
	Numbers of Employed Workers			
Farming	32,047	32,535	31,655	31,785
Forestry, fishing, and related activities	7,617	8,429	7,658	7,478
Mining	7,060	6,724	6,956	8,279
Manufacturing	24,601	23,376	22,343	22,606
Tourism	13,757	14,120	14,287	14,287
Federal Government	13,048	13,428	13,705	13,551
Accommodation	11,141	11,578	11,714	11,777
Total	**98,130**	**98,612**	**96,604**	**97,986**
Agriculture's Share of Total Employment	32.7%	33.0%	32.8%	32.4%

Source: U.S. Bureau of Economic Analysis: Regional Accounts.

Table 2. Number and Percent of Montana Farms and Ranches by Farm Area Categories: 1982 to 2002

Farms and Ranches (Farmland Acre Categories)	Census Year				
	1982	1987	1992	1997	2002
	------- Number of Farms and Ranches ------				
1 to 9 acres	1,551	1,940	1,209	898	1,481
10 to 49 acres	2,673	2,745	2,804	3,570	5,005
50 to 179 acres	3,080	3,019	3,061	3,575	4,497
180 to 499 acres	3,097	3,315	2,964	3,372	3,964
500 to 999 acres	2,640	2,737	2,521	2,675	2,970
1000 to 1,999 acres	3,345	3,460	3,040	3,127	3,034
2,000 or more acres	7,184	7,352	7,222	7,062	7,116
TOTAL	23,570	24,568	22,821	24,279	27,870
	Percent of Farms and Ranches (%)				
1 to 9 acres	6.6	7.9	5.3	3.7	5.3
10 to 49 acres	11.3	11.2	12.3	14.7	18.0
50 to 179 acres	13.1	12.3	13.4	14.7	16.1
180 to 499 acres	13.1	13.5	13.0	13.9	14.2
500 to 999 acres	11.2	11.1	11.1	11.0	10.7
1000 to 1,999 acres	14.2	14.1	13.3	12.9	10.9
2,000 or more acres	30.5	29.9	31.6	29.1	25.5
TOTAL	100.0	100.0	100.0	100.0	100.0
Average Farm Size by Acres	2,568	2,451	2,613	2,414	2,139

Source: USDA National Agricultural Statistical Service 2002 and 1992 Agricultural Census

Table 3. Number and Percentage of Montana Farms and Ranches by Value of Sales Categories, 1982 to 2002

Value of Sales Categories	Census Year				
	1982	1987	1992	1997	2002
	---------- Number of Farms and Ranches -- --------				
Less than $2,500	3,914	4,320	4,073	4,996	10,117
$2,500 to 4,999	1,795	2,006	1,764	2,024	1,776
$5,000 to 9,999	2,295	2,374	2,131	2,308	2,162
$10,000 to 24,999	3,703	3,912	3,413	3,415	3,043
$25,000 to 49,999	3,592	3,695	3,051	2,839	2,718
$50,000 to 99,999	3,928	4,064	3,528	3,340	3,027
$100,000 to 499,999	3981	3,945	4,492	4878	4,507
$500,000 or more	263	252	369	479	520
TOTAL	23,471	24,568	22,821	24,279	27,870
	-------- Percent of Farms and Ranches (%) --------				
Less than $2,500	16.7	17.6	17.8	20.6	36.3%
$2,500 to 4,999	7.7	8.2	7.7	8.3	6.4%
$5,000 to 9,999	9.8	9.7	9.3	9.5	7.8%
$10,000 to 24,999	15.8	15.9	15.0	14.1	10.9%
$25,000 to 49,999	15.3	15.0	13.4	11.7	9.8%
$50,000 to 99,999	16.6	16.5	15.5	13.7	10.9%
$100,000 to 499,999	17.0	16.1	19.7	20.1	16.2%
$500,000 or more	1.1	1.0	1.6	2.0	1.9%
TOTAL	100.0	100.0	100.0	100.0	100.0%

Source: USDA National Agricultural Statistical Service 2002 and 1992 Agricultural Census

Table 4. Market Value of Agricultural Sales and Percent of Total Sales by Value of Sales Categories, 1982 to 2002

Value of Sales Categories	Census Year				
	1982	1987	1992	1997	2002
	Market Value ($1,000)				
Less than $2,500	3,681	3,756	3,217	3,441	3,801
$2,500 to 4,999	6,474	7,248	6,397	7,284	5,753
$5,000 to 9,999	16,506	17,167	15,397	16,568	13,824
$10,000 to 24,999	61,398	64,842	56,448	55,965	43,120
$25,000 to 49,999	130,517	133,669	110,688	102,814	83,960
$50,000 to 99,999	281,273	291,553	252,596	240,368	191,941
$100,000 to 499,999	728,035	722,302	868,970	971,208	921,058
$500,000 or more	308,619	306,749	416,524	473,085	823,604
TOTAL	1,536,503	1,547,286	1,730,237	1,870,733	2,087,061
	Percent of Market Value (%)				
Less than $2,500	0.2	0.2	0.2	0.2	0.2
$2,500 to 4,999	0.4	0.5	0.3	0.4	0.3
$5,000 to 9,999	1.1	1.1	0.9	0.9	0.7
$10,000 to 24,999	4.0	4.2	3.3	3.0	2.1
$25,000 to 49,999	8.5	8.6	6.4	5.5	4.0
$50,000 to 99,999	18.3	18.9	14.6	12.9	9.2
$100,000 to 499,999	47.4	46.7	50.2	51.9	44.1
$500,000 or more	20.1	19.8	24.1	25.2	39.5
TOTAL	100.0	100.0	100.0	100.0	100.0

Source: USDA National Agricultural Statistical Service 2002 and 1992 Agricultural Census

Table 5. Percentage of Farms for which Farming is the Principal Occupation by Value of Sales Categories, 1997 and 2002

Value of Agricultural Sales	Percent of Operators for which Farming and Ranching is their Principal Occupation	
	1997	2002
Less than $2,500	29.8	39.2
$2,500 to 4,999	37.2	44.1
$5,000 to 9,999	47.3	49.8
$10,000 to 24,999	60.6	61.8
$25,000 to 49,999	77.6	73.9
$50,000 to 99,999	89.2	86.6
$100,000 to 249,999	95.2	92.7
$250,000 to 499,999	95.7	94.5
$500,000 or more	94.4	91.9
TOTAL	**64.7**	**63.5**

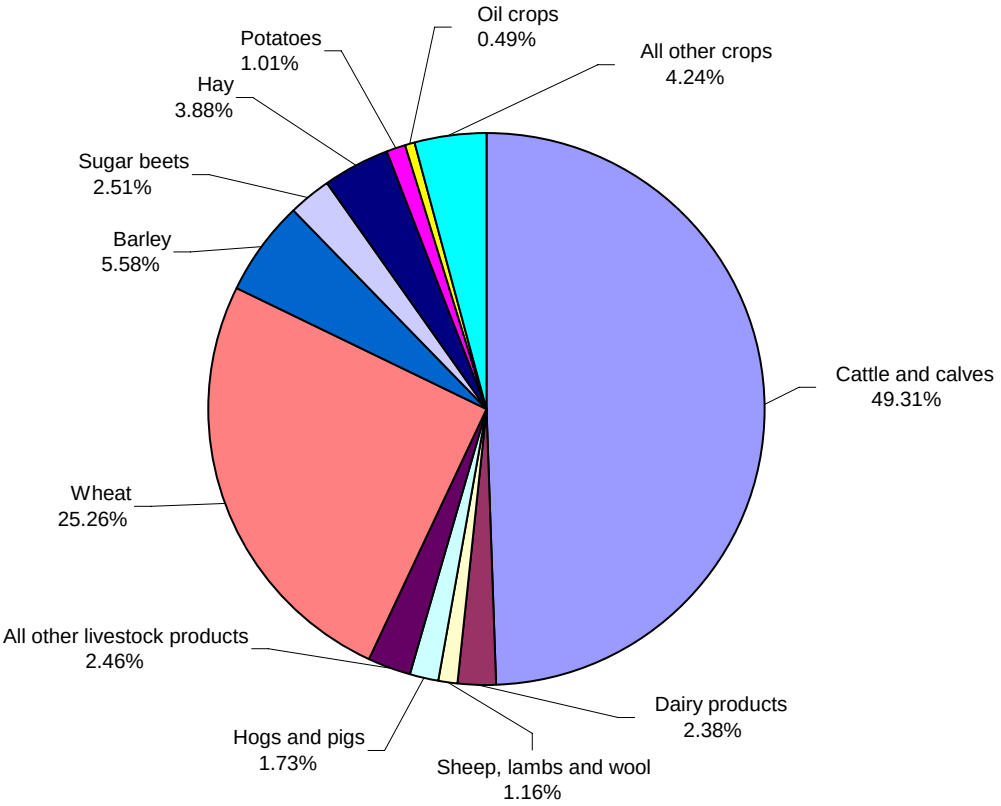
Source: USDA National Agricultural Statistical Service 2002 and 1997 Agricultural Census

Table 6. Types of Farm and Ranch Organization, 1982 to 2002

Type of Farm Organization	Census Year				
	1982	1987	1992	1997	2002
	Farm Numbers				
Individual or Family	18,842	19,506	17,723	18,751	22,448
Partnership	2,099	2,147	2,046	2,065	2,192
Corporations	2336	2656	2798	3121	2,730
Other	293	259	254	342	500
TOTAL	23,570	24,568	22,821	24,279	27,870
	Percent of Farms (%)				
Individual or Family	80.0	79.4	77.6	77.2	80.5%
Partnership	8.9	8.7	9.0	8.5	7.9%
Corporations	9.9	10.8	12.3	12.9	9.8%
Other	1.2	1.1	1.1	1.4	1.8%
TOTAL	100.0	100.0	100.0	100.0	100.0%

Source: USDA National Agricultural Statistical Service 2002 and 1992 Agricultural Census

Figure 1. Distribution of Market Cash recipts from the Sale of Agricultural Commodities in Montana in 2005 (Total = $2.24 billion)



Source: Montana Agricultural Statistical Service

Figure 2a. Montana Farm and Ranch Cash Receipts from the Sale of Livestock, Crops and Government Payments: 1965-2004 (millions of current dollars)

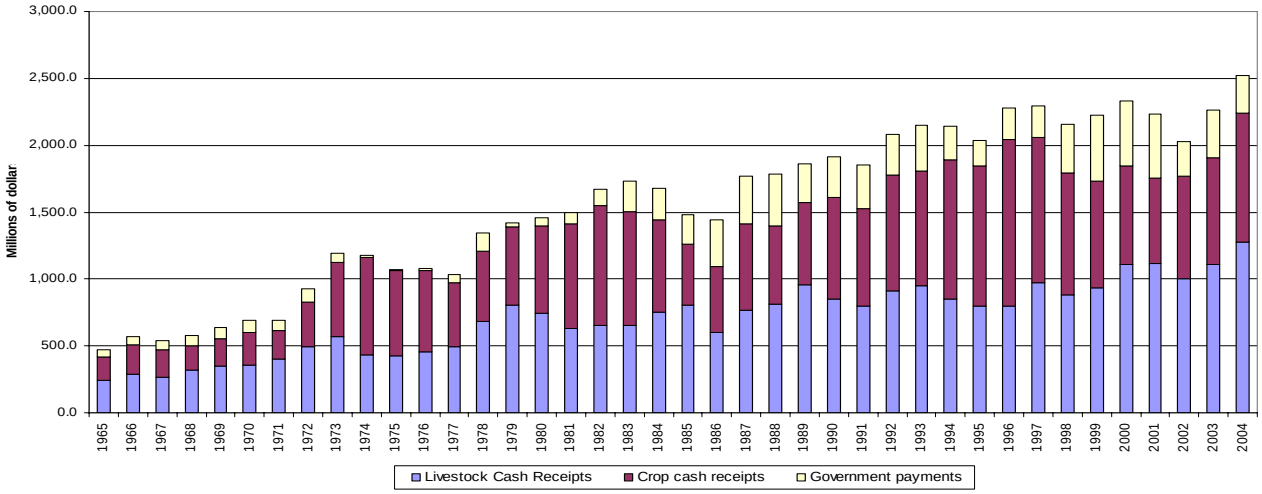
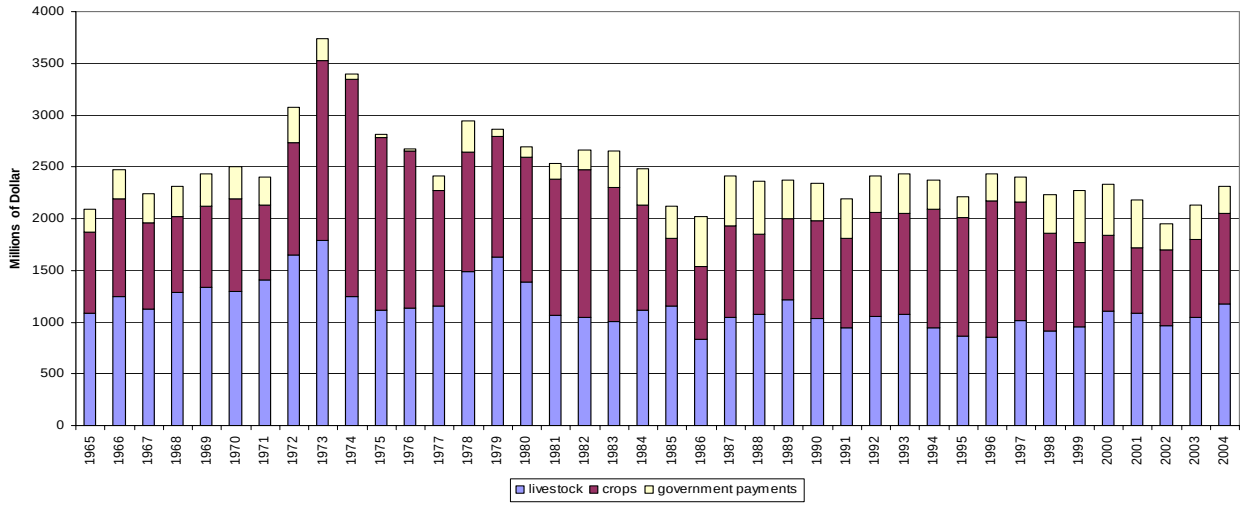
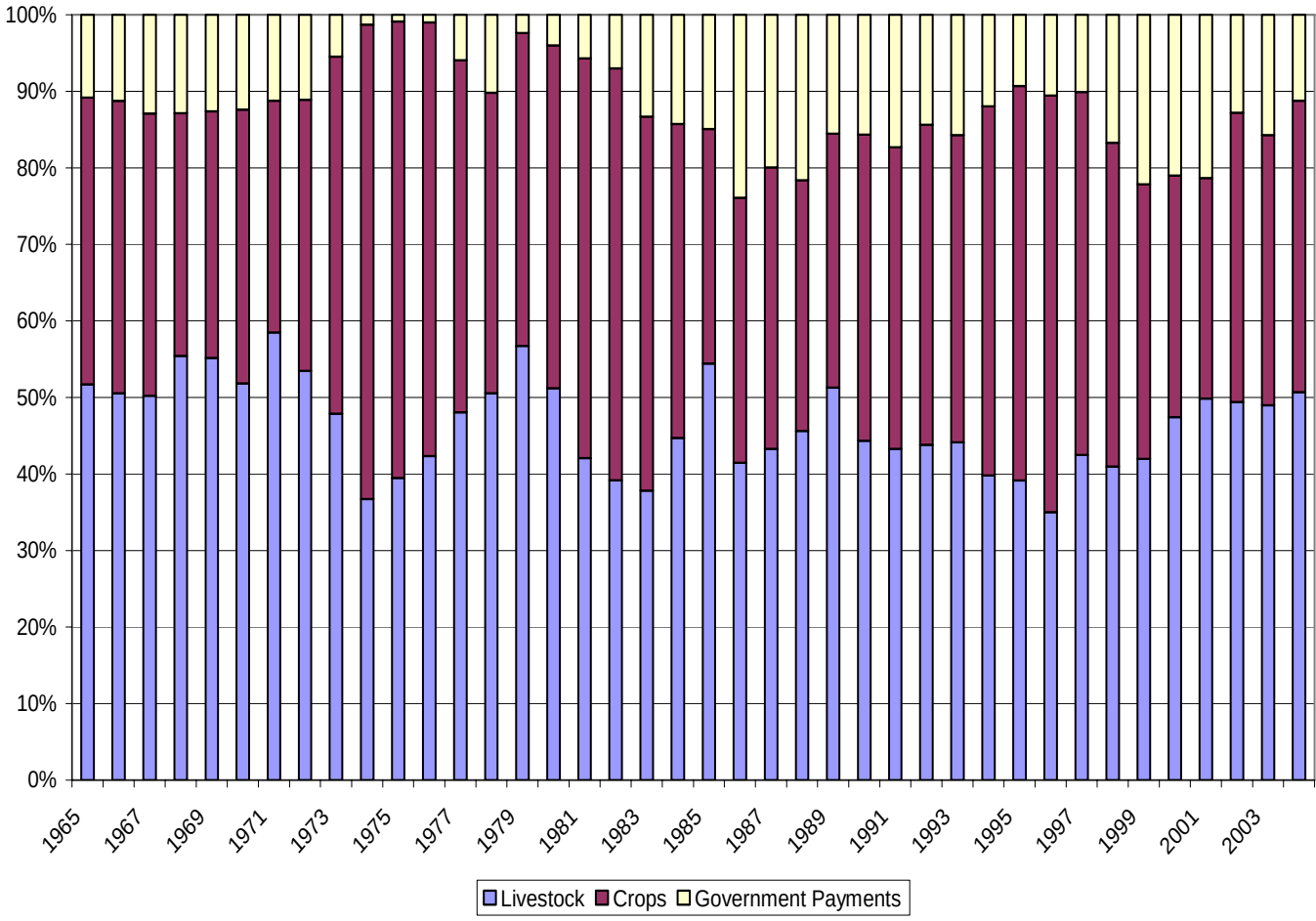


Figure 2b. Real (Inflation Adjusted) Montana Cash Receipts from the sale of Livestock, Crops and from Government Payments: 1965-2004 (millions of 2000 Dollars)



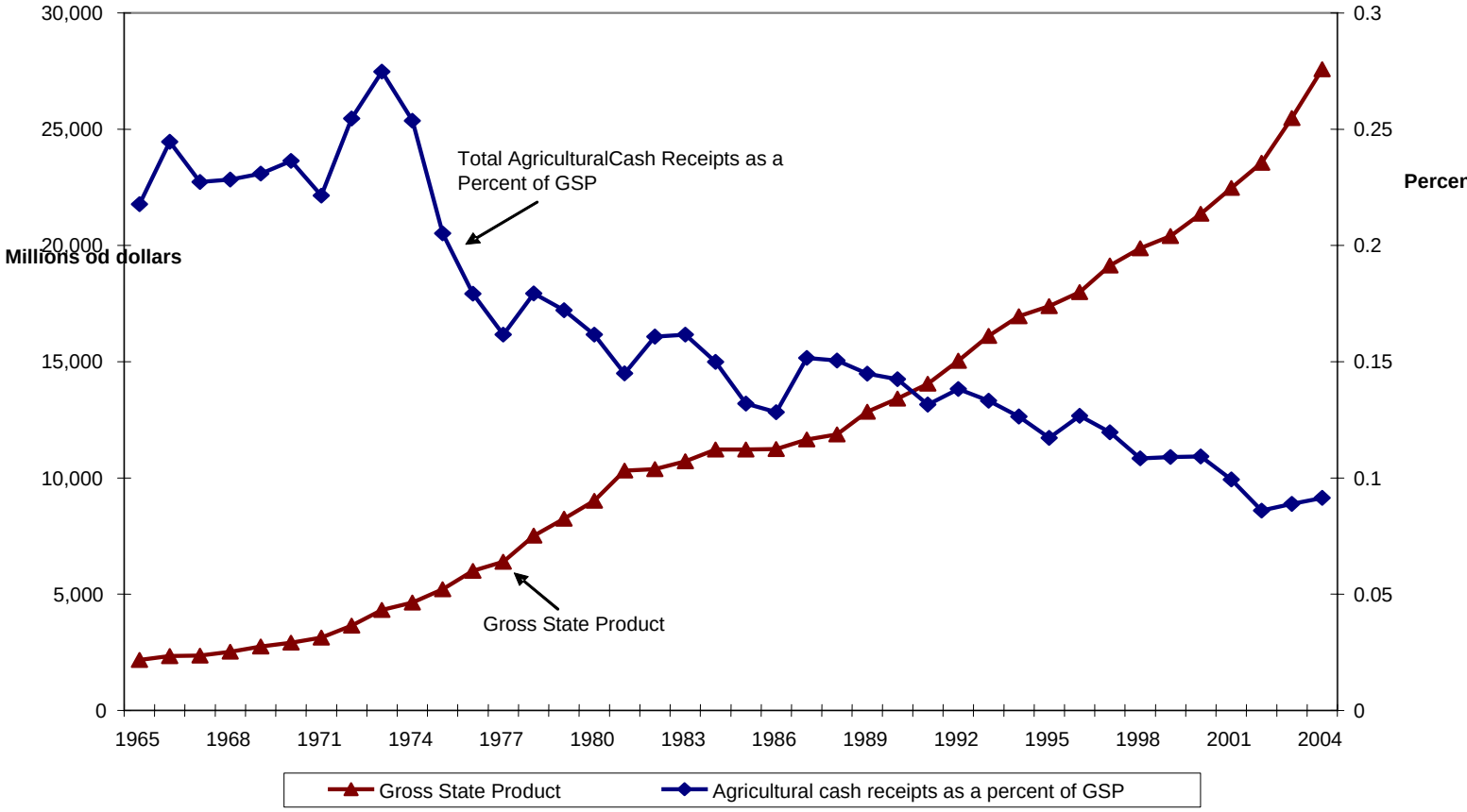
Source: Montana Agricultural Statistical Service

Figure 3. Proportion of Total Montana Farm and Ranch Cash Receipts from Livestock, Crops and Government Payments: 1965-2004.



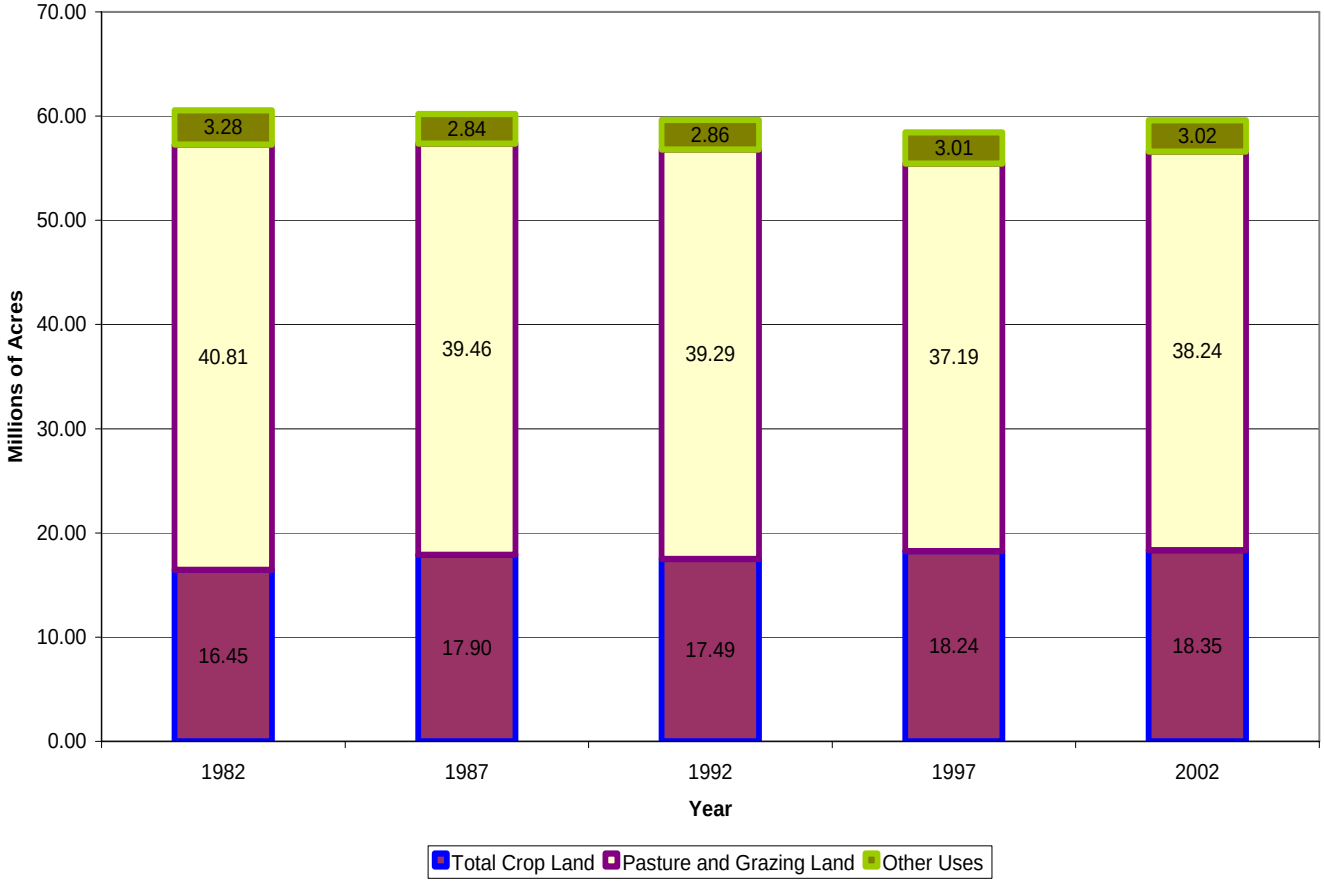
Source: Montana Agricultural Statistical Service

Figure 4. Agricultural Cash Receipts as a Proportion of Montana's Gross State Product: 1965-2004



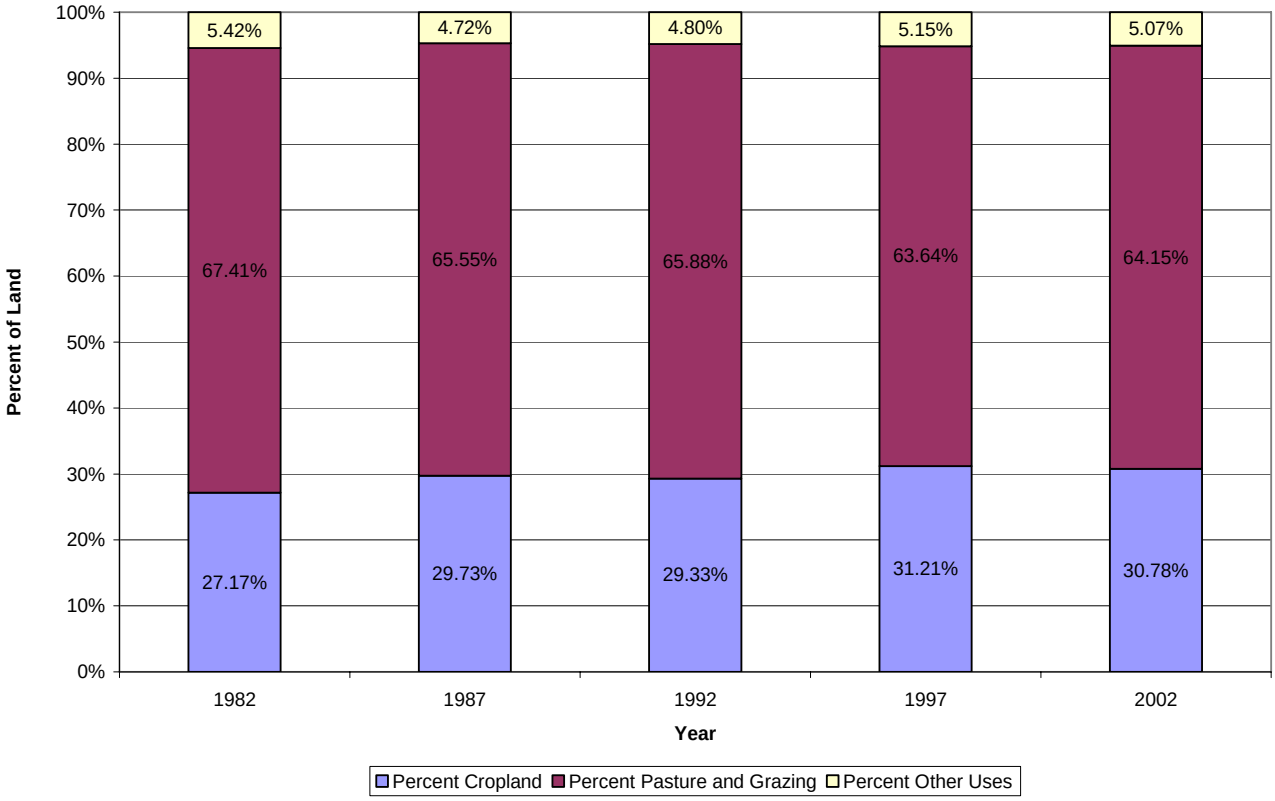
Sources: Data on Montana's Gross State Product are from the U.S. Bureau of Economic Analysis Regional Accounts. Data on total cash receipts received by farmers and ranches are from the Montana Agricultural Statistical Service

Figure 5: Total Land in Montana Farms and Ranches (millions of acres): 1982-2002



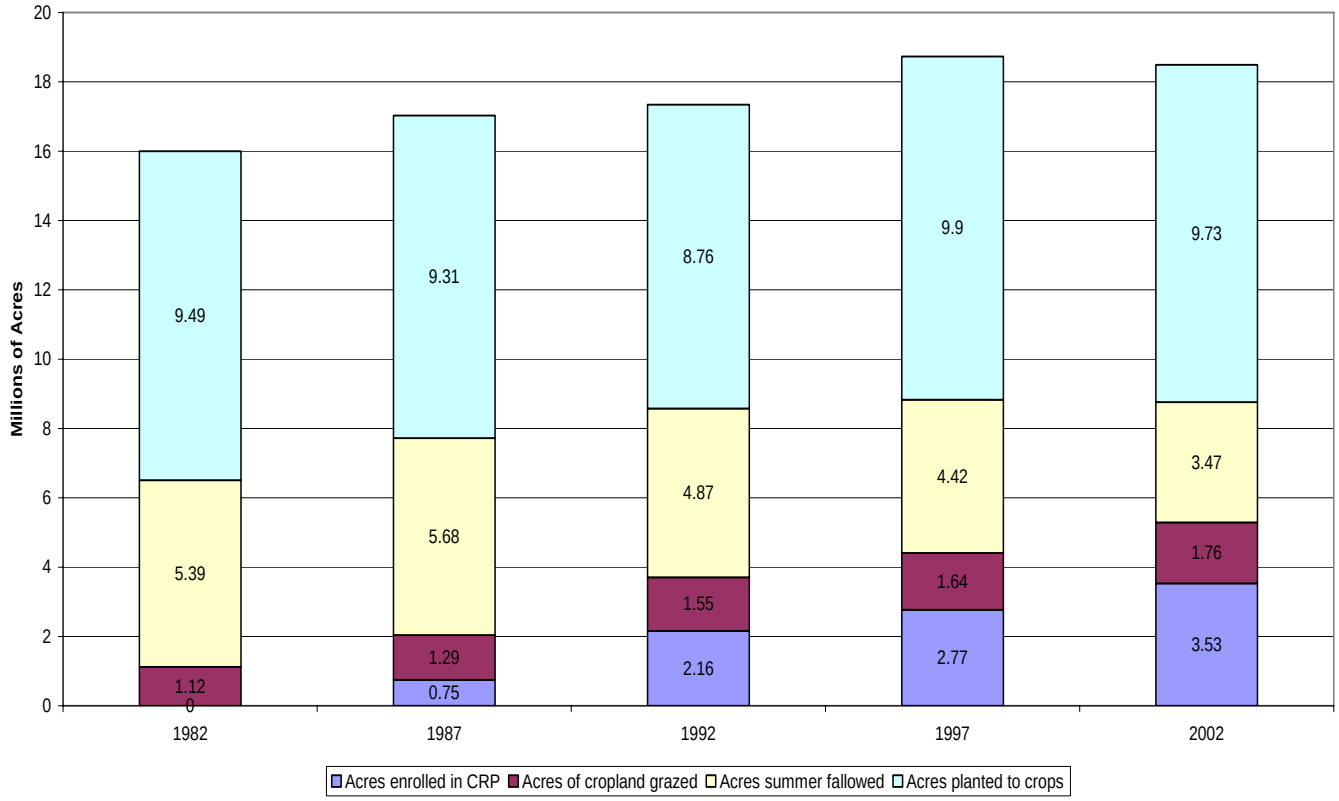
Source: USDA National Agricultural Statistical Service, 1992 and 2002 Agricultural Census

Figure 6: Proportional Allocation of Land on Montana Farms and Ranches: 1982-2002



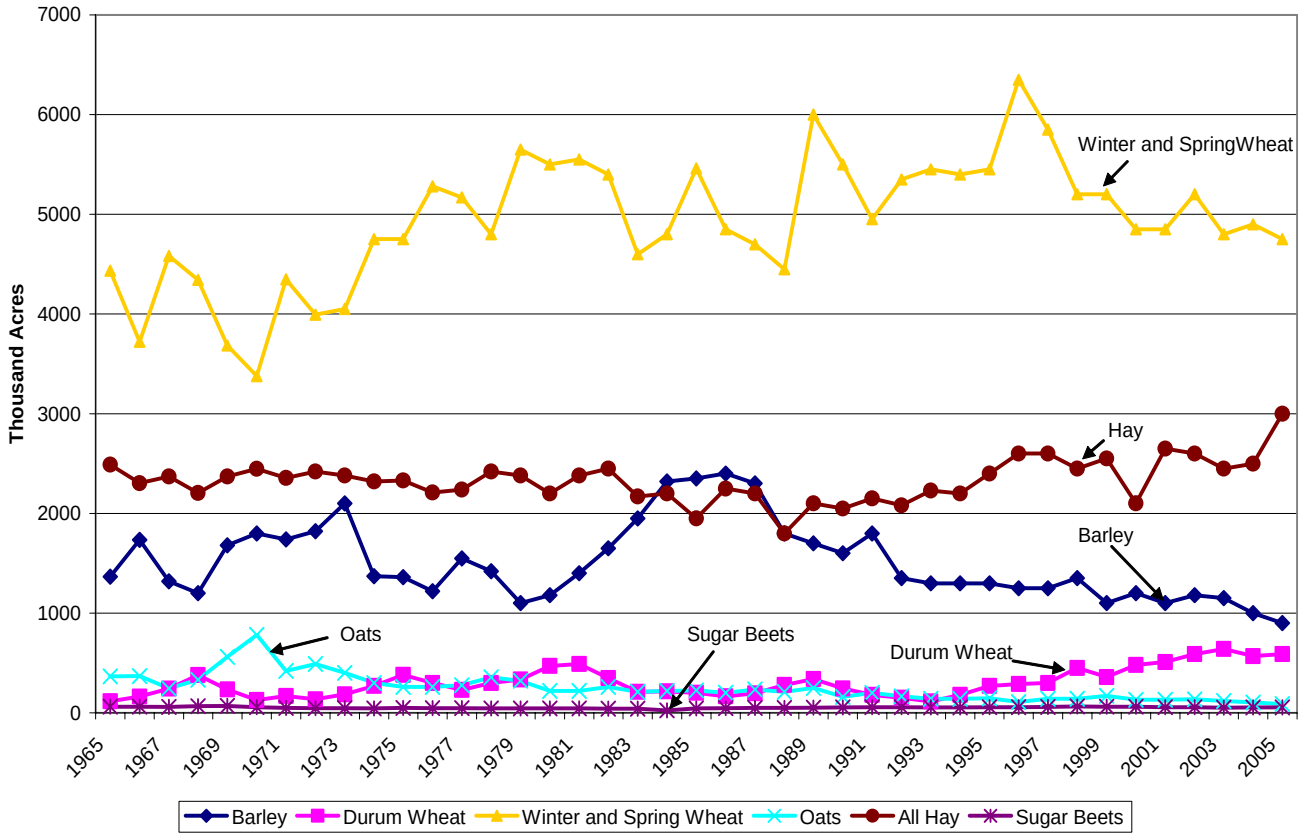
Source: USDA National Agricultural Statistical Service, 1992 and 2002 Agricultural Census

Figure 7: Allocation of Cropland in Montana: 1982-2002



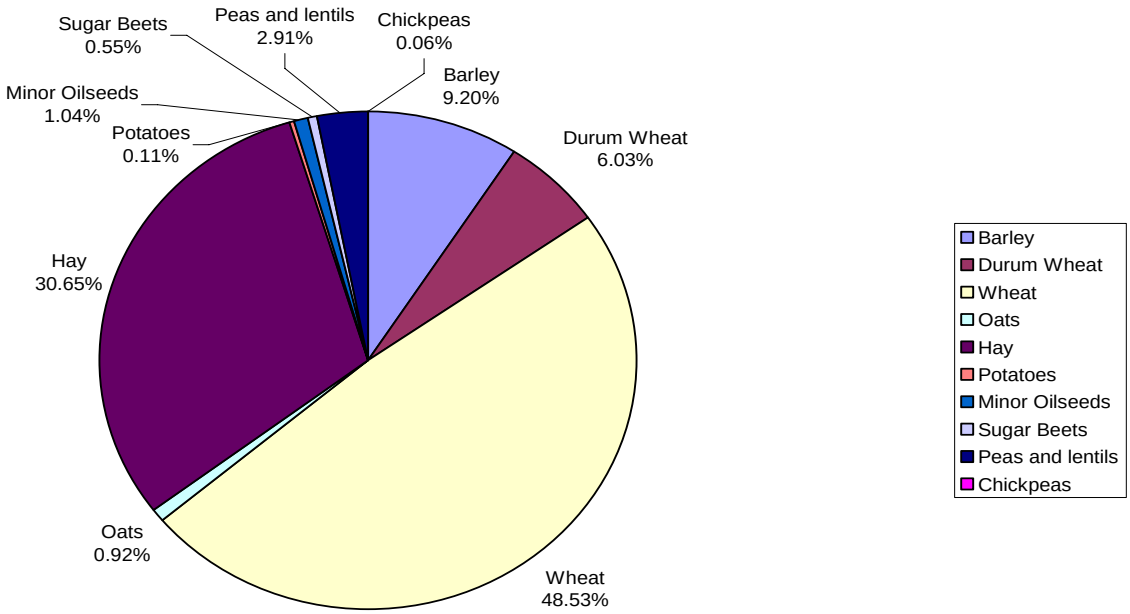
Source: USDA National Agricultural Statistical Service, 1992 and 2002 Agricultural Census

Figure 8. Harvested Acres of Cropland in Montana by Crop: 1965-2005



Source: Montana Agricultural Statistical Service

Figure 9. Distribution of Acres Planted to Crops in Montana by Crop in 2005
Total Planted Area = 9.79 million acres



Source: Montana Agricultural Statistical Service

Appendix A: Montana's Wheat Sector

From an economic and ecological perspective, wheat is the most important field crop raised in Montana and so deserves more detailed consideration than other crops. All wheat is not just wheat. Different varieties have different agronomic properties and quality attributes, and receive different prices in the market place. Montana's farmers are well aware of these facts and manage their operations to optimize the returns from their production of wheat. As a result, over time, the share of cropland allocated to different categories of wheat in the state has changed substantially.

Currently, the U.S. wheat industry produces six different classes of wheat: hard red spring wheat, hard red winter wheat, hard white wheat, soft red wheat, soft white wheat, and durum wheat. In Montana, hard red spring wheat and durum wheat are both planted in the spring (March, April or early May) and harvested in late July, August or early September. Hard red winter wheat is planted in September or possibly early October and harvested in July or August of the following year. These three classes are all planted on dryland and depend on precipitation (rainfall and snow) for moisture. In Montana, soft white wheat and soft red wheat are most often planted on irrigated land. Hard white wheat, also a dryland spring crop, is not widely grown in Montana.

Figure 10 shows the total area planted to wheat in Montana by three broader categories of wheat: durum, spring wheat other than durum, and winter wheat.[15] In Montana, most spring wheat (other than durum) is hard red spring wheat while most winter wheat is hard red winter wheat. As discussed above, the total area planted to all wheat is higher now than it was in the 1960s. Remarkably, it is also slightly higher than

[15] Data are not available from the USDA National Agricultural Statistical Service by each of the six classes of wheat at the state level.

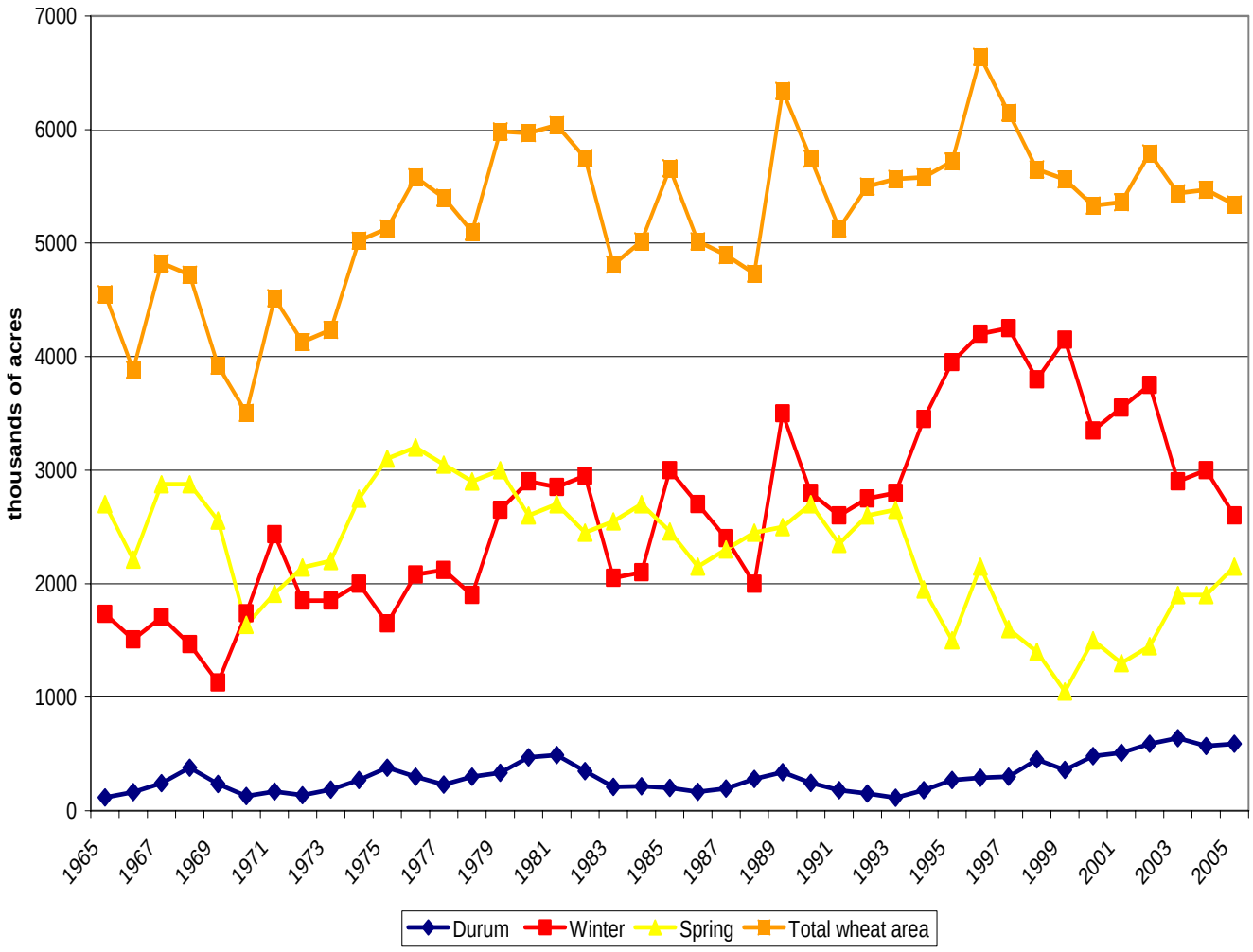
it was prior to the introduction of the CRP in 1985. Among the three categories of wheat, the area planted to durum wheat has ranged from 110 thousand acres in 1965 to as much as 640 thousand acres in 2003, and has been much higher over the past six years than between 1980 and 1996. The allocation of cropland between winter wheat and spring wheat has fluctuated over the period. Between 1965 and 1995, the areas planted to these two categories were quite similar. In 1995, however, the area planted to winter wheat began to increase and the area planted to spring wheat to decrease. This process continued until 1999, when the pendulum swung the other way. By 2005, the allocation of land between spring and winter wheat was again approximately the same.

These events demonstrate the importance of agronomic conditions and market forces in farmer's production decisions. Figure 11 shows the annual average prices received by Montana producers for these three categories of wheat. While winter and spring wheat prices generally appear to track each other closely, between 1996 and 2001, winter wheat prices were between 15 cents and 50 cents per bushel higher than spring wheat prices. In addition, winter wheat yields improved relative to spring wheat yields in the 1990s. However, between 2000 and 2004, many areas of Montana were drought stricken and fall moisture levels were relatively poor. Thus, at the margin, producers tended to wait until spring to make decisions about whether they should fallow land they had harvested in the previous growing season. Thus, if they then chose to plant a crop, their only option was spring wheat. In addition, spring wheat prices improved somewhat relative to winter wheat prices. Hard red spring wheat tends to have higher protein levels than hard red winter wheat, an attribute for which millers are often willing to pay a premium. Protein premiums substantially improved in 1999 and, while moderating in

subsequent years, remained relatively large between 2000 and 2004. Finally, durum prices rose sharply in the early 1990s, moderated in 1998 but improved steadily until 2002 and remained above their long run average between 1998 and 2004.

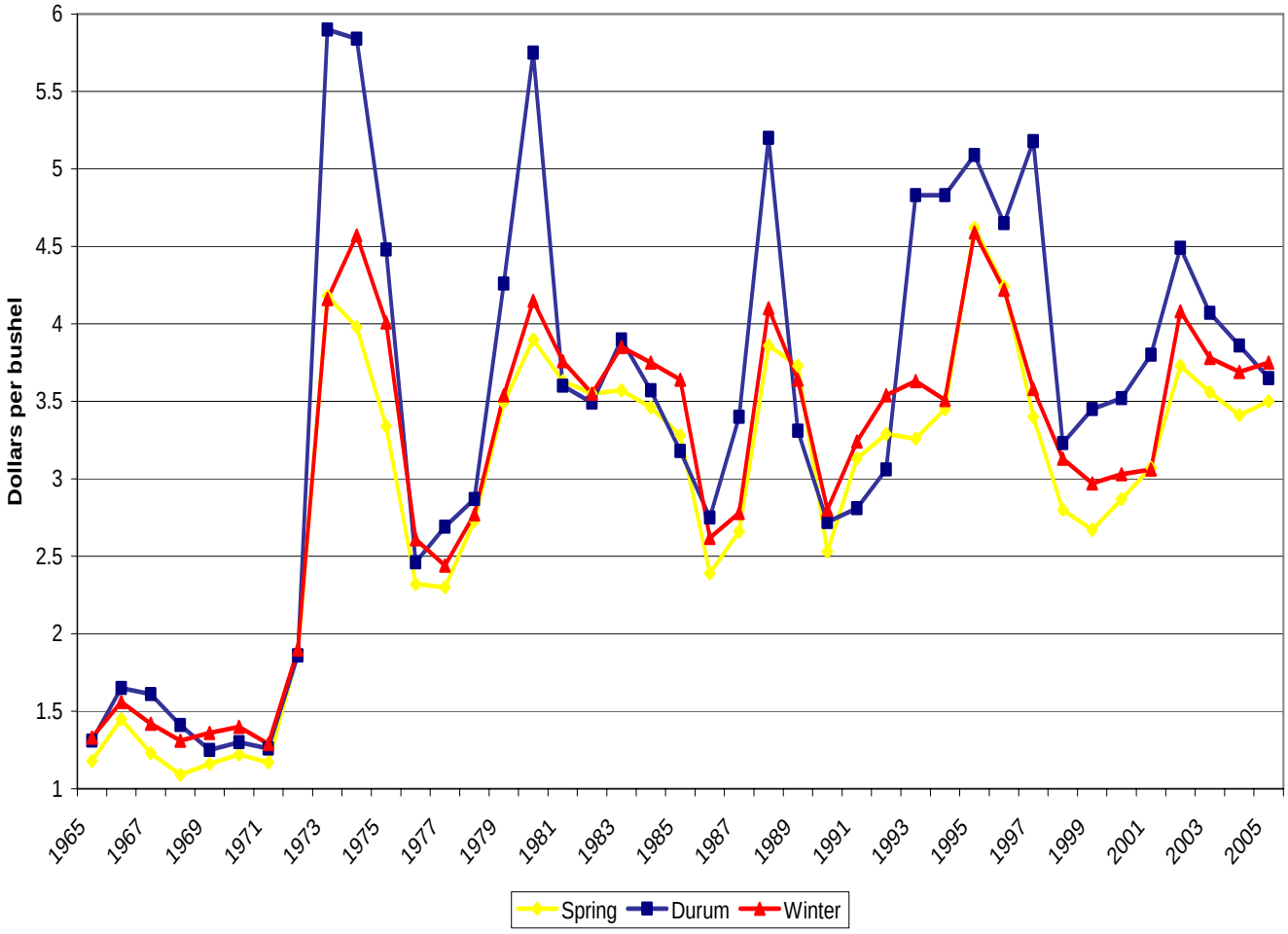
This evidence indicates that agricultural producers in Montana have a history of responding to price incentives and agronomic conditions in making their wheat planting decisions in order to ensure their operations remain financially sustainable. It is a theme that is replicated in the history of livestock production in Montana over the past forty years.

Figure 10. Area Planted to Wheat in Montana by Category of Wheat: 1965-2005



Source: Montana Agricultural Statistical Service

Table 11. Montana Prices of Durum, Spring and Winter Wheat: 1965-2005
(dollars per bushel)



Source: Montana Agricultural Statistics

Appendix B: Montana's Livestock Sector

In Montana, as shown in figures 1, 2 and 3, almost two thirds of farm and ranch land is used for livestock pasture and grazing, and cattle alone provide over 45 percent of total farm and ranch cash receipts from sales of products. Montana agricultural producers raise cattle, sheep, hogs and dairy cows, as well as chickens, horses, goats, llamas, bison, and other forms of livestock for commercial purposes. However, by a considerable margin, beef cattle are a much more important source of agricultural incomes than other forms of livestock. In contrast, the dairy industry has declined over the past forty years and the Montana sheep industry is also much smaller than it used to be. Hogs are major sources of income for some agricultural operations, although in total they provide only a small proportion of total cash receipts for Montana farmers and ranchers.[16]

Figure 12 presents annual state-wide data on the size of the cattle herd, the annual calf crop, the herd size for breeding sheep, the annual lamb crop and the December inventory of hogs for the period 1965 to 2005. The size of Montana's cattle herd has fluctuated substantially over this period, ranging from a low of 2.25 million head in 1990 to a high of 3.38 million head in 1974. However, there is no clear cut long run trend in herd size, and fluctuations in Montana beef cattle inventories have closely followed the national cattle cycle.

The cattle cycle, a product of the gestation period for cattle and a set of complex economic incentives, operates as follows. In periods when the national cattle herd is relatively small, beef prices tend to be relatively high and cattle operations have incentives both to build up their herds, partly by retaining older cows that would normally be culled, but also to sell calves. These objectives tend to conflict and, as a

[16] Hutterite farmers have tended to specialize in hog production.

result, national and local cattle herds typically increase relatively slowly over several years. As the size of the national cattle herd increases and, correspondingly, the quantity of beef available for sale on the market increases, beef prices tend to moderate. In response, agricultural producers then begin to reduce herd size but again the process typically takes several years. The data for Montana presented in Table 7 indicate that three cattle cycles have taken place over the past forty years with three peaks in herd size in 1976, 1986 and 1996, each of which were years in which beef prices were relatively low.

This might suggest that cattle cycles are regular and well behaved but that is not the case. Many other factors have affected cattle production in Montana and the prices Montana cattle producers receive. These include demand shocks; that is, events that affect the willingness of households to buy a product. Annual average prices received by cattle producers for beef are presented in Figure 13. These prices have been adjusted to account for the effects of inflation and show average prices received each year in terms of the purchasing power of the dollar in 2005.[17] As noted above, cattle prices have generally been low when the Montana and national cattle herd has been large and bottomed out in 1976, 1986, and 1996. Cattle prices have generally been relatively high in years where the national cattle herd has been relatively small, as in 1973, 1980, 1990, and 2005.

However, in the late 1970s, an underlying downward trend in average cattle prices began to appear. This trend appears to have been partly the result of decreases in demand for beef that stemmed from two causes. One was a long run decline in the prices of

[17] Nominal or current year prices were adjusted to real prices in terms of the purchasing power of the dollar in 2005 using the national average Consumer Price Index published by the United States Bureau of Labor Statistics.

competing sources of protein — including the prices of pork, chicken and fish — that began in the late 1970s. The other was increasingly widespread concerns about potential adverse health effects of eating red meat. These concerns derived from health studies that were initially published in 1978 and 1979. In addition, over the same period, innovations in food technology and genetic research resulted in supermarket products for chicken, pork and fish that were more convenient and involved less preparation time for households.

This longer run downward trend in real beef prices may have reversed itself. Staring in the late 1990s, new information about the health effects of red meat became available and some competing sources of protein also became more expensive (for example, fish). However, cattle prices in 2005, while at record highs in terms of nominal dollars, were lower in real terms than the average prices obtained in the mid and late 1960s and the 1970s. In part, this is because the amount of beef provided by the national cattle herd increased, even though over successive cattle cycle there was no underlying trend in herd size. The increase in beef production was attributable to increases in the average size and quality of beef cattle and calves of between two and three hundred pounds per animal between 1965 and 2005. These improvements resulted from research-driven improvements in beef cattle genetics and herd management practices.[18]

The data in Figure 12 tell a much different story for the sheep industry. Anyone who has read Ivan Doig's evocative novels of life along Montana's Rocky Mountain

[18] Specific events may sometimes have substantial short and medium term effects on commodity markets. For example, the discovery of a BSE infected dairy cow in Idaho on December 23, 2003, sent U.S. beef and cattle markets into a tail spin for several weeks. However, the markets soon stabilized and average cattle prices returned to their per-December 23 levels by March of 2004. This does not mean that this BSE event had no longer run consequences. Several studies suggest that the subsequent closure of Japanese, South Korean and other markets to U.S. beef exports reduced prices received by Montana and other producers by as much as five or six percent throughout 2004 and 2005.

eastern front knows that sheep were a major source of farm and ranch incomes in the first two decades of the twentieth century. This is no longer the case. Between 1965 and 2005, the sheep breeding herd in Montana declined dramatically by about 80 percent from about 1.4 million to 280 thousand ewes and rams. Correspondingly, the annual lamb crop declined from about one million head in 1965 to 275 thousand head in 2005.

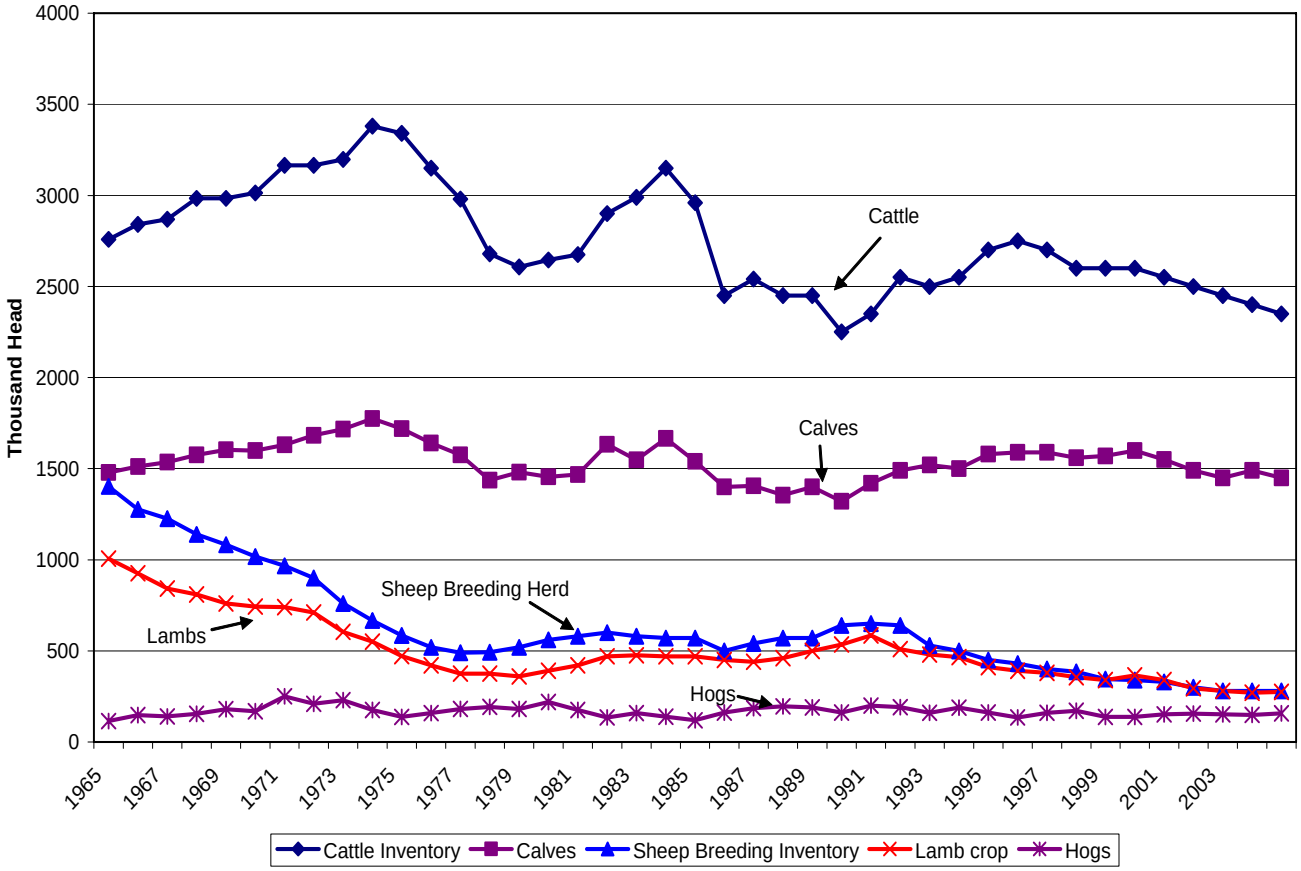
A natural concern is why Montana's sheep industry declined. The state's sheep industry is closely linked to the national sheep industry, and the national sheep herd has also declined dramatically since the mid 1960s. Thus the factors that have driven farmers and ranchers throughout the United States to scale back their sheep operations are likely to have had similar effects in Montana. Sheep produce two major commodities, wool and lamb. Price data for these two commodities are presented in Figure 13. These data provide important insights about why both the U.S. and Montana's sheep industry have declined so rapidly. In real terms, although they have fluctuated a great deal from year to year, wool prices exhibited a persistent underlying downward trend between 1965 and 2005, to the extent the inflation adjusted average price of wool between 1990 and 2005 was about 50 percent lower than between 1965 and 1975. The decrease in wool prices was in large part the result of a decline in demand for wool in clothing, carpet and other fabric based products as the prices of competing man-made fibers dropped and technical innovations improved the quality and range of uses for those fibers (for example, consider GORTEX). In addition, consumer preferences shifted toward cotton based clothing products.

In inflation adjusted terms, lamb prices tended declined between the late 1960s and 2002 (although they recovered a little in 2003, 2004 and 2005) as competition from

sheep industries in other countries increased and the domestic demand for lamb also declined as chicken and pork became less expensive and more convenient sources of protein. Lamb weights also did not increase to the same proportional extent as live cattle weights over the period 1965-2005. These price movements and differences in the development of animal weights made the use of pasture and grazing land for sheep less attractive relative to its use for cattle, and the result was a sharp and relatively rapid decline in Montana's sheep industry which seems unlikely to be reversed in the near future.

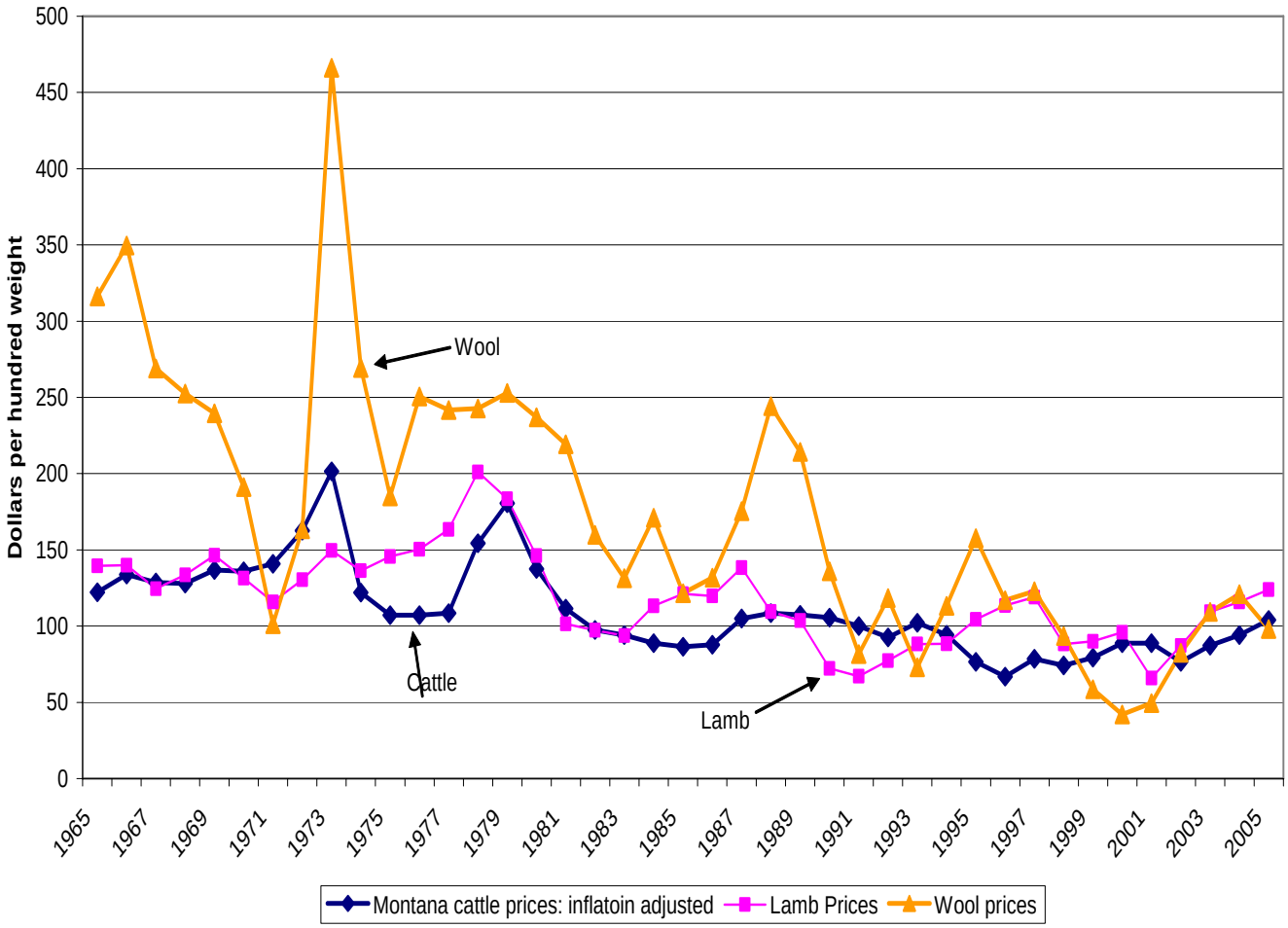
Hog production in Montana was relatively stable over the period 1965 to 2005. A relatively small number of producers have managed a state-wide December inventory that ranged from 114 thousand head in 1965 to 251 thousand head in 1973 and was relatively stable at about 150 thousand head between 2001 and 2005. Dairy cattle and dairy products, for which data are not provided, have declined in relative importance in the state over the past thirty years as changes in transportation technologies and transportation costs have led to the concentration of milk production in large scale dairies in states like Arizona and California. Innovations in milking technologies, driven in part by raising wages and improved working conditions for workers in alternative occupations, have also played a role in increasing the scale of dairy operations. Many individual dairies now manage and milk several thousand cows, creating significant waste management problems that also appear to be more easily handled in the arid climates found in states like Arizona and California.

Figure 12: Montana Livestock Inventories: 1965-2005



Source: Montana Agricultural Statistical Service

Figure 13. Montana Cattle, Lamb and Wool Prices: 1965-2005 (real prices adjusted for inflation to reflect the purchasing power of a dollar in 2005)



Source: Montana Agricultural Statistical Service