Land, Land Use and Competitiveness

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Working Paper 2004-2

Abstract: Land costs account for a significant proportion of the total costs for many agricultural products that are traded internationally, especially for the major grain crops that the U.S. exports in competition with several other countries. For owner-operators, a common form of tenure in the U.S. and most other countries, most land costs are implicit and involve few cash outlays, i.e., are opportunity costs that are important in the long-run but that may not affect production decisions in the short-run. To the extent that land is rented or where the owner is making mortgage payments, however, larger explicit land costs are incurred and can be a very significant factor in the cost of production and competitiveness. U.S. cost of production data for most crops in recent years indicate that the returns on equity, including land and other owned resources are zero or negative, i.e., the prices of many farm products are too low to cover total costs when opportunity costs are included as part of the cost of production. Thus, land costs may not be a significant factor in competitiveness in the current policy framework where government payments are a significant part of the net returns of farm operators.

Keywords: agricultural trade, land, land use, competitiveness, agricultural policy
JEL Codes: F1 - Trade, F13 - Trade Negotiations, Protection, Q15 - Land Use, Q18 - Agricultural Policy

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Introduction

Land is an important input into agricultural production and represents a significant contributor to the cost of producing agricultural products. Land use, values, and institutions (such as property rights or tenure arrangements) vary greatly from country to country and can, thus, affect the competitiveness of agricultural products in international markets. Land use and ownership also are sensitive and, often, emotional issues that have implications beyond land's function as a factor of production. In addition to agricultural production, land in farms contributes to scenic and recreational activities, provides habitat for wildlife, affects the quantity and quality of water available for other uses, is important for development, and has other amenity values. Urban and rural non-farm residents value and are often willing to contribute significantly to maintaining a viable farm sector and other open space through subsidies, special tax provisions, farmland preservation programs, and similar policies in the United States and elsewhere (Colyer 1998; Irwin, Nickerson and Libby 2003; Libby 2000, 2001). Thus, multi-functionality in land use is an important and contentious issue in the current round of World Trade Organization (WTO) negotiations (see, e.g., OECD 2001; Paarlberg, Bredahl and Lee 2002; Peterson, Boisvert and De Gorter 2002).

This paper examines land and land use activities as they impact agricultural costs and the international competitiveness of agricultural products. The next section examines conceptual and theoretical issues in land use and land costs. Following that, land costs in the U.S. and its major competitors in international agricultural trade are explored. Then policies and programs that mitigate or affect land costs in other ways are covered, with the next section evaluating land use and farm size effects on costs and competitiveness. The final section draws conclusions and implications for the competitiveness of U.S. agricultural products.

Conceptual Issues

Land is generally viewed as a fixed input into the production process to which variable inputs such as seed, fertilizer, chemicals, labor and other inputs are added to obtain production of crops such as corn, soybeans, wheat, hay, etc. The determination of land costs as part of the costs of production of agricultural products is not always easy, at least from the standpoint of the farm operator, since there are various arrangements under which land is controlled including full ownership and various forms of tenancy–Frohberg and Hartmann (1997) discuss some of the issues involved in handling quasi-fixed factors in calculating measures of competitiveness. Land may be rented for cash or under crop-share arrangements and many countries have regulations that affect rental/lease terms (some countries prohibit any type of farmland rental). In addition, there may be property taxes or other costs associated with the ownership and operation of farmland. If the land is owned, there might be mortgage payments including interest costs and the time when the land was purchased (or inherited or obtained in other ways) can be a factor, although it does not affect the opportunity cost. Thus, the actual cash or other outlays that a farmer makes for the use of the land

being farmed can vary considerably, from being very low for land that is fully owned to being very high in the cases of recently mortgaged land or in some cases of tenancy where the cash rental or crop share payments are relatively large.

In economic analyses, these problems are generally averted by making the land charge the opportunity cost of the investment value of the land (see, e.g., AAEA Task Force 2000; USDA 1999; Ali 2002). The AAEA Task Force (2000, p. 2-11) defines opportunity cost as:

> The **opportunity cost** of any good or service is its value in its next best use. For example, the opportunity cost of the service of an input used in the production of any particular commodity is the maximum amount that the input would produce of any other commodity. Opportunity costs are usually measured in monetary terms so that the opportunity cost of any good or service is the maximum amount the good or service could receive elsewhere for use as a factor of production.

The task force recognized that the land valuation/cost situation is complex and that it could be difficult to develop comparable cost estimates for land. They recommend using cash land rental rates where these are available; this rate would generally include property taxes and maintenance costs which are the responsibility of the landlord. These rates also are expected to reflect only the agricultural use value of the land. One of the complications in determining the appropriate opportunity cost for land is that agricultural land often has an non-agricultural value component due to urbanization and the demand for land by non-agricultural interests.

There are alternatives to the use of cash rent when such data are not available, either because there is too little land rented in an area (country) or because such data are not collected or analyzed. The AAEA Task Force (2000, chapter 7) recommends the following alternatives where cash rents cannot be used: 1) use of share rents, 2) agricultural market value of the land multiplied by the appropriate (generally market) rate of interest plus property taxes and maintenance costs, and 3) calculation of residual net returns where all operating costs, including the cost of capital such as machinery and operators unpaid labor, are deducted from the gross returns. Since share rent terms vary significantly, within and between countries, adequate knowledge of the terms of such agreements is essential for the area where this approach is to be used. With respect to alternative two the task force recommends using the agricultural value of the land. Determining the agricultural use value, as distinct from its market value, can be a problem since in the U.S. each of the 49 states with use value assessment for property taxes has a different approach (Colyer 1998). The task force's recommendation is for determining the cost of production for agricultural purposes, such as required by the 1996 Federal Agricultural Improvement and Reform (FAIR) Act; this might not be appropriate for other purposes since land owners should be concerned with the opportunity cost of the total value of their investments, not just the agricultural value. Use of the third alternative often produces unrealistic results for the value and cost of the land since the returns to equity are often low or even negative, i.e., the gross returns may cover all of the variable but not all of the fixed costs as is the case for many agricultural products produced in the U.S., at least according to USDA cost of production studies (see, e.g., Foreman 2001; Ali 2002; Short 2001). This would indicate that the land resource is overvalued relative to the economic returns obtained at prevailing product prices.

While the approach of using agricultural use values is appropriate for the cost of production

information that the USDA is required to develop under the FAIR Act, it may not be appropriate for other purposes since landowners may be interested in obtaining returns on the total value of their investment in land, including the non-agricultural values attached to their investments. That is, the opportunity cost on the total value of the investment including what could be earned from converting the land to non-farm activities–in this situation multiply the market value of the land by the appropriate rate of return would more closely approximate the opportunity cost. However, the market values may be close to the agricultural use values since much of the farmland has few, if any, alternative uses that could earn more than in an agricultural use. The exceptions, of course, are for land located in or near urbanizing or industrial development areas.

U.S. Land Prices and Costs

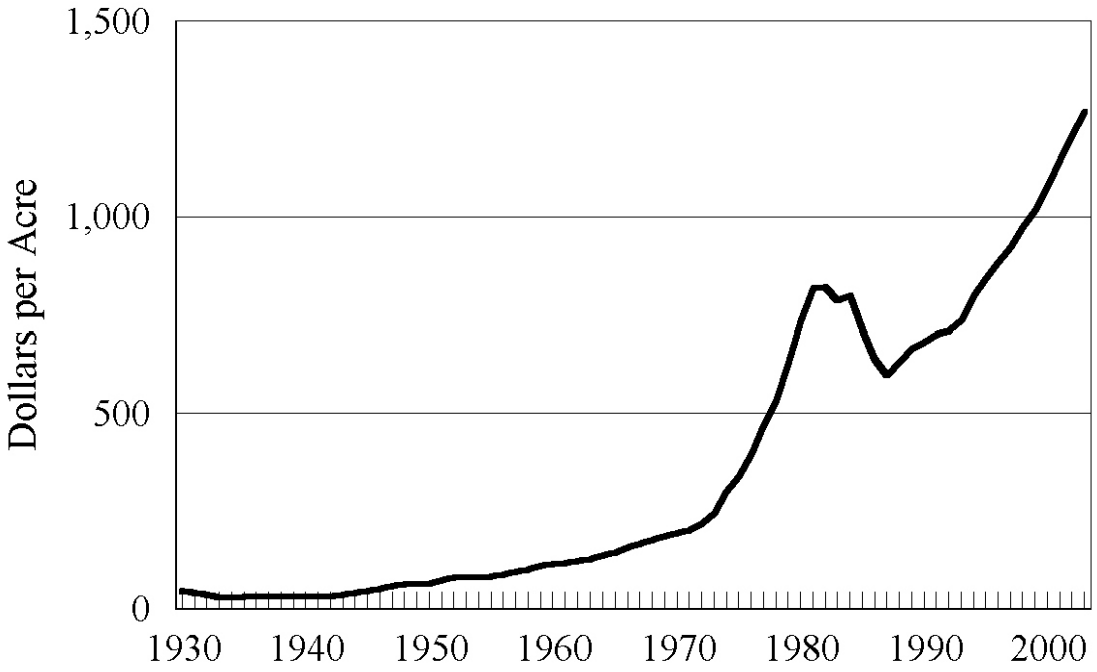
The U.S. is endowed with a large supply of productive land that is located within a wide range of conditions, both geographically–due to the relatively large size of the country–and climatically from temperate to semi-tropical, enabling the country to produce a wide range of agricultural products. The land base is, thus, heterogeneous, but is comprised of large areas of productive land under both rainfed and irrigated production systems. Because of this heterogeneity there is also a wide range of prices, costs and productivities associated with the country's agricultural land base.

Land Prices

The average price of farmland in the U.S. (excluding Alaska and Hawaii)[1] in 2003 was $1,270 per acre, a record high since land prices have again been increasing (ERS 2003b). Land prices differ widely within the U.S., with average state level prices in 2003 varying from a low of $230 per acre in New Mexico to a high of $8,500 per acre in New Jersey. The latter state has relatively little agricultural land, is very urbanized and, thus, non-farm forces are the major factors determining the value of farm real estate. New Mexico, on the other hand, is in the west and is arid and semi-arid with large amounts of range land in farms. Three states in the heart of the corn belt in the midwest, Illinois, Indiana and Iowa, had average 2003 farmland prices of $2,770, $2,750 and $2,050, respectively. Although the values of land in those states are determined primarily by their agricultural productivity, they also are influenced to some extent by non-farm values including population and urbanization pressures.

U.S. agricultural land prices have trended up since reaching a low in the depression of the 1930s, except during the early to mid-1980s. Figure 1 shows average nominal U.S. agricultural land prices for 1930 to 2003. After rising slowly from a low of $30 in 1933 to $203 in 1971, per acre land prices rose very rapidly until 1982 when they peaked before dropping sharply as a result of an international economic downturn and the farm credit crisis. Per-acre prices then declined sharply until 1987, when the again began to increase again. Since the late 1980s, they have risen each year and are now (2003) at historically high levels. However, they are now rising by only 5-6 percent per year compared to 10-20 percent or higher in the 1970s.

Figure 1. U.S. Average Farm Real Estate Prices



Source: ERS, U.S. Department of Agriculture

Cost of Production

USDA cost of production information is used to develop a set of land cost estimates for selected major U.S. products that enter into international trade in a significant way. The USDA bases its current cost estimates, those made in compliance with FAIR Act requirements, on the AAEA Task Force (2000) recommendations, but has a long history of making cost of production estimates that include land costs and also has long collected information on land values and farmland rental rates (see, e.g., Krupa and Barnard 2001). Table 1 has average U.S. land costs and associated data for five major crops, corn, soybeans, wheat, rice and cotton, that also are important in international trade. Per acre land costs are similar for corn and soybeans since they tend to be grown in the same regions, but wheat and cotton have much smaller land costs while rice, which requires large investments in land improvement, has higher costs. Wheat is generally grown in semi-arid areas in the U.S. where land values are lower, while cotton is grown in the south and southwest where land values are lower than in the mid-west where most of the corn and soybeans are produced. Although the land cost per acre of corn is higher than for soybeans, the cost per bushel is less because the yield of corn is much higher. The proportion of land to total costs varies from 8.2 percent for cotton to 31.0 percent for soybeans. These proportions reflect the relative importance of other costs of

production as well as land differences.

Table 1. U.S. Average Land Costs and Related Data for Selected Crops, 2001

Crop	Land Cost per Acre $	Land Cost per bu. $	Land as % of Total	Yield per Acre, bu.	Value $ per Acre	Total Costs $ per Acre	Net per Acre $
Corn	86.50	0.60	25.1	144	266.92	343.90	-76.98
Soybeans	81.98	1.91	31.0	43	178.45	264.13	-85.68
Wheat	39.54	1.15	21.6	34.5	98.40	183.34	-84.94
Rice	104.29	1.51[a]	11.5	69[a]	328.67	596.03	-267.36
Cotton	43.83	0.07[b]	8.2	636[b]	271.40	530.52	-259.12

Source: ERS, U.S. Department of Agriculture; a. cwt; b. pounds

Although USDA data indicate that most crops have returns sufficient to cover the variable costs of production, the net returns generally become negative when all the fixed costs, land, machinery and equipment and unpaid labor, are included. For 2001, the losses varied from $76.98 per acre for corn to $267.36 per acre for rice. This situation has deteriorated since the FAIR Act was passed in 1996 when income supports were decoupled from current production and all restrictions on crops that could be planted as well as required set-asides were removed–except for a prohibition on planting fruits and vegetables on the cropland formerly used for the supported crops. Thus, government payments are not now included in the returns to the crops and these tend to be considerable for the crops listed in Table 1. Government payments under the Fair Act and emergency acts passed each year to supplement the programmed payments have been substantial, accounting for a large share of the net income of farmers producing crops eligible for the payments. According to the Environmental Working Group (EWG), in 2001 some 1,621,183 recipients received over $16.3 billion in the decoupled income payments, an average of slightly over $10,000 per recipient, which includes landlords as well as farmers.[2] Since the averages include a large number of small farms, the typical commercial grain farm would receive substantially larger payments.

Average U.S. and regional land costs based on cash rental values for selected commodities (corn, soybeans and wheat crops together with cow-calf and farrow to finish hog production) in 2001 are reported in Table 2. The regions used for these data are the new farm resource regions developed by ERS and do not follow state boundaries as in the old farm production regions, although some have similar geographic coverages (see ERS 2000). The heartland region, for example corresponds closely to the midwest in the former classification and is the most appropriate for determining the costs for corn and soybeans; it contains all of Indiana, Illinois and Iowa plus parts of Ohio, Kentucky, Missouri, Nebraska, South Dakota, and Minnesota. The per acre land costs vary considerably from region to region for the same crop as well as between crops. Since there are wide variations in land productivity from one area to the other, the costs for the crops are converted to a per bushel basis by utilizing the average yield per acre reported in the same tables by ERS.

However, considerable variability remained despite the conversion, indicating that differences in land productivity are not the only cause of the regional differences in land costs.[3]

Table 2. U.S. Land Costs for Selected Agricultural Products by Area, 2001 (U.S. Dollars)

Region	Corn/ acre	Corn/ bushel	Soybean/ acre	Soybeans/ bushel	Wheat/ acre	Wheat/ bushel
U.S. average	86.50	0.60	81.98	1.91	39.54	1.15
Heartland	96.90	0.64	92.38	2.01	66.80	1.20
Northern Crescent	67.56	0.57	68.71	1.86	69.66	1.14
Northern Great Plains	53.20	0.48	40.45	1.12	37.17	1.27
Prairie Gateway	71.21	0.47	51.38	1.32	29.62	1.00
Eastern Uplands	50.43	0.53	41.14	1.05	-	-
Southern Seaport	47.86	0.35	37.05	0.95	46.04	1.35
Mississippi Portal	-	-	55.85	1.69	48.31	0.84

Source: ERS, U.S. Department of Agriculture
(for corn: http://www.ers.usda.gov/publications/sb974-1)

Land costs tend to be very low for typical livestock enterprises, only about 0.1 percent of total costs for a farrow to finishing hog operation and 0.25 percent for cow-calf enterprise (ERS 2003a). These do not include the land cost of the for the harvested feed fed to the livestock, since that would be included in the cost of the feed. Livestock enterprises are not directly subsidized as are the typical major grain and fiber crops, but they benefit from the low prices of feed grains used for producing the finished products and that are a result of the subsidies. Land costs, however, are not apt to be a major factor in the competitive position of livestock enterprises, even for those directly using land such as cattle grazing.

Land Cost Comparisons

Comparisons of land costs of U.S. agricultural competitors is often difficult because of a lack of data or differences in the way data are collected or reported. However, in some cases studies by the USDA have resulted in comparable cost data being developed, e.g., for Brazil and Argentina. In others, as in the EU, data on land values and rents are reported even though there may not be cost of production studies comparable to those carried out by the USDA.

Argentina and Brazil

Schnepf, Dohlman and Bolling (2001) made a comparative study for ERS of Brazilian and Argentinian production and cost of major field crops which are competitive with those produced in

the U.S., especially for soybeans where they have become major competitors in the international markets.[4] For 1998/99 both of those countries produced soybeans at lower costs than the U.S.–for Brazil $172.09 in Parana and $162.08 per acre *versus* $234.91 for the heartland resource region of the U.S.; for Argentina the cost was $198.76 (Table 3). Brazil had slightly lower yields than the U.S. in 1998/99 (41 versus 46 bushels per acre), but Argentina had higher yields (nearly 51 bushels). Land costs were much lower in Brazil than the U.S., $14.20 per acre in Parana and $5.84 in Mato Grosso compared to $87.96 in the U.S. heartland. The differences were more than sufficient to account for the total differences in costs–Brazil's variable costs were higher than in the U.S.–$115.14 and $132.06 in the two regions, respectively, *versus* $78.59 per acre in the U.S. Argentina's land costs were only $20 per acre less than in the U.S. ($62.72) and its variable costs were higher by about the same amount ($96.29, for around a $22 per acre difference), but its other fixed costs were low enough to account for the difference in total costs. Thus, very low land costs in Brazil help account for it being competitive in international markets and lower land costs also contribute to Argentina's competitive position. However, the much lower variable costs for the U.S. enable the nation to remain competitive, at least in the short run.

Flaskerud (2003) compared U.S. (North Dakota and Iowa) costs of soybean production with those for Mato Grosso, Brazil in 2003 and found similar results as those in 1998/99. However, land costs for Mato Grosso had increased to $20.24 per acre, an indication that increased production in that region was increasing the demand for and prices of land.

European Union

The EU collects and reports values and rents for agricultural land and some of the individual countries, e.g., United Kingdom, also publish such data (EU 2003; Walsh 2001). Table 4 shows a summary of land rents, values, land costs per acre and per bushel of wheat for the EU for those member countries for which data were available on the EU website. The approaches, as well as

Table 3. Land Costs for Soybeans in Argentina, Brazil and the U.S., 1998-99 (U.S. $)

	Brazil		Argentina	United States
Cost Component	Parana	Mato Grosso	N BA, S SF[1]	Heartland
Land Costs	14.28	5.84	62.72	87.96
Total Variable Costs	115.14	132.05	96.29	78.59
Total Costs	172.09	162.08	198.76	234.91
Land as Percent of Total	8.30	3.60	31.56	37.44
Yield in Bushels/Acre	41.35	41.65	50.60	46.00
Land Cost per Bushel	0.35	0.14	1.24	1.91

Source: Schnepf, Dohlman and Bolling, 2001

1. Northern area of Buenos Aires Province and southern area of Sante Fe Province

Table 4. Land Vales and Rents in the European Union, 2000[a]

Country/Land type	Rent: E/ha	Rent: E/acre[b]	Rent: $/acre[c]	Value: $/acre	Wheat[d] bu/acre	Land $ Cost/bu
Belgium: Arable Land	188.25	76.18	70.17	5,272	117.8	0.60
Belgium: Meadow	175.26	70.92	65.33	4,598	--	--
Denmark: Agricultural Land	308.57	124.87	115.02	4,051	111.2	1.03
Germany: Total Rents	221.00	89.43	82.38	6,273	108.4	0.76
Germany: New Rents	249.00	100.76	92.81	--	--	--
France: Arable Land	132.02	53.43	49.22	1,346	108.1	0.46
Luxembourg: Agr. Land	158.78	64.26	59.19	19,866	82.5	0.72
Holland: Arable Land	474.20	191.90	176.76	13,583	124.0	1.43
Holland: Meadow	281.85	114.06	105.06	13,313	--	--
Austria: Agricultural Land	244.18	98.81	91.02	n.r.	67.8	1.34
Finland: Agricultural Land	150.53	60.92	56.11	1,466	53.7	1.04
Sweden: Agricultural Land	100.28	40.58	37.38	741	88.6	0.42
United Kingdom: England	188.27	76.19	70.18	4,364	119.1	0.59
United Kingdom: Wales	123.96	78.21	72.04	2,016	--	--
United Kingdom: Scotland	159.38	62.88	57.92	2,042	--	--
United Kingdom: N. Ireland	303.61	122.86	113.17	5,092	--	--

Source: EU Data base (http://europa.eu.int/comm/agriculture/agrista/2001).
a. In a few cases, the latest data recorded were for 1999; b. 1 acre = 2.471 hectares; c. 1$ = 1.0856 Euros (Source: ERS: http://www.ers.usda.gov/Data/exchangerates/RealAnnual CountryExchangeRates.xls); d. Source: EU 2003; wheat yields are for the UK, not just England.

the laws, customs and practices in land tenure of the countries in developing this data vary.[5] Thus, they report data for somewhat different classifications of agricultural land. Table 4 also shows average land prices for land in each of the countries which provides further insights into land rents; in Holland, for example, land prices are very high but rental rates, while also high, are more in line with the agricultural use value than the market value. Rental rates in Europe, while varying significantly from one country to the other, are not extremely different than those in the U.S., that is, they tend to be representative of the agricultural use value of the land, although if the actual opportunity cost of the land investment were used the land costs would tend to be higher than indicated by the rental rates–as they also would be in the United States. Wheat yields by country in

the EU were used to calculate the land cost per bushel of production; these varied from $0.42 per bushel in Sweden to $1.43 per bushel in Holland compared to the average of $1.15 per bushel in the U.S. However, land costs based on rental rates were considerably lower in France, Germany and the UK, the larger wheat producers in the E.U. While their per acre land costs for wheat are considerably higher than in the U.S., their yields per acre are much higher and, thus, costs per bushel are lower. Wheat in the U.S. is generally grown in semi-arid areas of the grreat plains while the climate in Europe is characterized by adequate rainfall comparable to that of the midwest of the U.S. which grows mostly corn and soybeans, but relatively little wheat.

Other Countries

Although many other countries publish costs and returns for their major crops, they do not include a separate land cost estimate. Thus, it is difficult to determine land costs, or rents for Canada, Australia, and some of the other countries that compete with the U.S. for agricultural exports. In Canada, the average value of land and buildings in 2002 was about 42 percent of the U.S. value, $504 (C$ 792) per acre compared to $1,210 per acre for land in the U.S.[6] Similarly, the Australian Bureau of Agricultural and Resource Economics (ABARE) reported an average per acre value of land and buildings for farms producing wheat and other crops of $176 (A$ 325)–these farms averaged 1,736 hectares (4166 acres).[7] Thus, in general, competitor countries tend to have lower land costs than the U.S. except for the EU (and Japan).

Land Use and Competitiveness

Land use patterns, cultural norms, and institutional factors can have significant effects on cost of production and competitiveness since they can be important factors in farm size. Land use and farm size and, hence, economies associated with size vary considerably both within and between countries. Data on land use and farm size for the U.S. and its more important agricultural competitors are reported in Table 5. A notable feature of this information is the average size of farm in the U.S. (434 acres per farm), which far exceeds those in the EU with an average of 46 acres per farm, but where the average size varies from 12 acres (Iceland) to 167 acres (United Kingdom). The EU averages are still relatively small, even though several countries have had polices to encourage consolidation of small and fragmented holding for many years (Jacobs 1997), but implies that most EU farmers are not able to take full advantage of cost savings associated with larger farms. However, many farms in countries such as France and the United Kingdom are considerably larger than the average.

While the average size farm in Brazil is also relatively small, those in areas such as Mato Grosso, a primary area producing soybeans, are larger and tend to be fully mechanized; Flaskerud (2003, p. 10) indicates that two thirds of the farms in Mato Gross are over 2,500 acres. Farm sizes in Argentina also tend to be large, with an average from the 2002 census of agriculture of 1,332 acres; farms in Sante Fe and Buenos Aires Provinces, where most Argentinian soybeans are produced, averaged 993 and 1,237 acres, respectively (INDEC 2003). Similarly, Australia and Canada have large farms, on average larger than those in the U.S., especially those producing their major products entering into international trade. Thus, while the EU probably has a competitive

disadvantage based on size, many other counties that compete with the U.S. have farms as large or larger than those in U.S. areas of primary agricultural production.

Mitigating/Confounding Factors

Several factors can mitigate and/or add to the costs associated with the use of land in agriculture. These include property and other taxes, farmland preservation programs, institutional influences including property rights, inheritance rules (and taxes), tenancy rules/customs, land subsidies such as green or recreational payments, provision of technology through public institutions (research, education and extension), and location and its effects including transportation and transportation subsidies. These factors can affect efficiency, cost of production and, hence, competitiveness.

Property and Other Taxes

Taxes on real estate, including farmland, are one of the more ubiquitous sources of public revenue, largely because land is fixed in location, easy to determine ownership, and relatively easy to collect taxes on because of the possibility of confiscating the land for unpaid taxes . In addition, many jurisdictions in the U.S. levy taxes on farm personal property, including equipment and livestock. Although land taxes are included in rental value of farmland and, thus, are omitted as a separate cost item when that approach is used, farmland owners must actually pay the taxes each year–they do not pay land rents; a land charge based on opportunity costs is appropriate but is not a factor in short-run production decisions. While there are many methods for levying property taxes, the most common, at least in the U.S., is an *ad valorem* tax, one based on the value of the property, usually the market value. In the U.S., these are local and, sometimes, state taxes; they provide much Of the sup port for local (municipal and county) governments and contribute substantially to the support of local schools, although there has been a tendency for state governments to provide more of the support for schools.

Because the market value often exceeds by a considerable amount, the value in agricultural production (based on, say, the capitalization of net revenue), this can result in large tax burdens for farmers. To alleviate this burden, all states have instituted farmland use value assessment and taxation programs with one single exception, Michigan[8] (see, e.g., Raab and Hauser, 2003, for how one state's program operates). These programs reduce the tax burdens and, hence, the actual costs of farming, contributing to the competitiveness of the sector (see, e.g., Colyer 1998; England 2002; Tavernier and Li 1995). Canadian property taxes are also at the provincial and local levels and are a major source of support for local schools. As in the U.S., most of the provinces provide some type of reduction in property taxes for farmland including exemptions of some properties from taxes, assessments at less than the market value, rebates (by the provincial government) of part of the taxes paid, deferral or forgiveness unless the land use changes, and lower tax rates than for other properties (Groenewegen 2000).[9]

Estate and inheritance taxes are another area where agriculture often receives special treatment. Although Federal estate taxes are to be phased out under 2002 tax legislation (but currently are slated to be reinstated after 2010), they have been a factor in the inheritance of farmland

Table 5. Land, Agricultural Land Use and Farm Size, 2000

Country	Total Land Area (acres)	Farmland 1000 acres	Area in Farms %	No. of Farms 1,000	Farm Size (acres)
United States	2,379,435	942,980	43.4	2,172	434
Canada	2,463,827	184,590	7.5	277	666
EU (15)	801,298	322,312	43.4	6,988	46
Austria	20,723	8,399	40.4	210	40
Belgium	7,539	3,450	46.0	67	51
Denmark	10,648	6,588	61.4	63	105
Finland	83,560	5,464	6.5	91	60
France	136,281	73,799	53.8	680	109
Germany	88,225	42,174	47.8	534	79
Iceland	25,452	9,640	22.1	821	12
Ireland	17,364	10,917	62.6	148	74
Italy	74,464	38,057	50.5	2,315	16
Luxemburg	639	334	46.0	3	111
Netherlands	10,262	4,883	47.1	108	45
Portugal	22,729	9,590	45.0	417	23
Spain	125,035	62,827	58.6	1,208	52
Sweden	111,189	7,364	7.0	80	92
United Kingdom	60,025	38,850	69.8	233	167
Japan	93,358	11,691	13.9	2,337	5
Australia[a]	1,912,925	1,125,581	58.8	71	14,357
Argentina[b]	687,062	418,108	60.9	317,816	1,332
Brazil[c]	2,112,140	618,266	29.3	4,860	180

Sources: Europa (http://europa.eu.int/comm/agriculture/agrista/2001/table_en/en33.htm); FAOStat database (http://apps.fao.org/page/collections?subset=agriculture); CIA World Fact Book (http://www.odci.gov/cia/ publications/factbook/index.html): ERS, USDA.
a. Farm numbers and acrs for 1999/00: Source ABARE (http://www.indec.mecon.gov.ar/default.htm).
b. Farm numbers and size for 2002: Source INDEC (http://www.indec.mecon.gov.ar/default.htm).
c. Farm numbers and size for 1995: Source Ministry of Agriculture: (http://www.agricultura. gov.br/spa/211.xls).

and maintenance of farming operations as farm size and land values have escalated. Farms, however, were subject to special provisions which increased the threshold value at which the estate becomes subject to tax (Lowenberg-Boer and Boehlje 1985). Many European countries also have special provisions for facilitating the inheritance of farmland (Ravenscroft, Gibbard and Narkwell 1999).

Farmland Protection and Preservation

Several states, especially those most affected by urbanization pressures, have developed special legislation to help preserve farmland (Colyer 1998; Nickerson and Hellerstein 2003). In addition to use values for property taxes and special provisions of the estate tax, planning and zoning, agricultural districts, purchase/transfer of development rights (or easements), and right-to-farm laws are the general approaches taken to help preserve farmland subject to development pressures. Planning and zoning, although effective in urban settings, have not been effective approaches to preserving farmland. Use value assessment and taxation removes some of the pressure to convert farmland by helping to make agriculture more profitable, but is not an effective long-run method of preserving farmland due to the pull of high development prices, especially to farm families approaching retirement. Similarly, agricultural districts and right-to-farm-laws can contribute to preserving agriculture but are not long-run solutions. In the U.S., thus, several states have developed programs for the purchase of development rights (PDR) as a means to provide longer-run protection of their agricultural sectors (the Federal Government provides limited funds to assist with PDR programs). Under these programs, farmland owners can sell the development rights, the difference between the market price and agricultural value of the land, to a public agency, thus benefitting from the higher market value of their land without selling it for development purposes. These programs, however, are expensive and most jurisdictions have only limited funds for carrying out their PDRs.

European countries, with higher population densities than the U.S., have long faced the problems of development pressures and many have instituted programs to regulate and help preserve their agricultural sectors (Ravenscroft, Gibbard and Markwell 1999; Jacobs 1997). Although there is a tendency for relatively strict regulation of land related activities, there is a great amount of variation among the several European countries in the approaches and methods used to influence their agricultural sectors. Planning and zoning tend to be relatively strict and it is often difficult (or impossible) to make changes in land use. Measures also include public purchase of land and its resale (at favorable rates) to new farmers; in Holland the compensation may also include income payments for up to 12 years (Jacobs 1997, p. 5). In addition countries often control or regulate tenancy and/or conditions or rates for renting land and may also regulate or assist with rights to succession. Ravenscroft, Gibbard and Markwell (1999) classify the European systems as open or closed. The closed systems have a primary purpose of "supporting the continuation of family farming" (p. 25) while the open systems' purpose is "to improve the financial and technical efficiency of the farming industry" (p. 25). Thus, despite the adoption of the EU's common agricultural policy (CAP), there is still considerable variation in some of the institutions and approaches to land use among the current 15 members of the EU, as well as among the 10 scheduled to join the union.

Subsidies and Green Payments

The industrialized nations have subsidized their agricultural sectors in various ways and these have affected land values with consequent impacts on competitiveness. In the U.S., farm incomes were first supported during the depression in the 1930s with price supports and acreage allotments under the Agricultural Adjustment Act (AAA) of 1933 and subsequent legislation (see, e.g., Knutson, Flinchbaugh and Penn 2003). These were continued after World War II until the agricultural act of 198x, when the program shifted to income support through paying farmers the difference between the market price and a target price set by the legislation; set asides were used to limit production and, hopefully, reduce the costs of the programs. The 1996 FAIR Act decoupled the payments from production and eliminated nearly all production controls. One of the major consequences of the price supports as well as the income support programs was that the higher net returns from the government payments were capitalized into the value of the farmer's land (see, e.g., Jasinowski 1973). In addition to price and income support farmers also received subsidies to carry out conservation practices which helped to increase the productivity and value of the land, as did the Federally (and state) supported agricultural, research, extension, and education programs. Higher land prices translate into increased opportunity cost and land rents, raising the cost of production and, hence, tending to decrease competitiveness. However, the increased productivity of the land (and farm labor though improved machinery and equipment) increased crop and livestock yields, reducing the per unit costs of production and increasing the competitiveness of U.S. farm products. Increased land productivity has contributed to the ability of U.S. farmers to remain competitive in many products. However, improved technologies have spread to other countries, which has tended to reduce the competitive edge of U.S. producers.

Conclusions and Implications

Land costs account for a significant proportion of the total costs for many agricultural products that are traded internationally, especially for the major grain crops that the U.S. exports in competition with several other countries. For owner-operators, a common form of tenure in the U.S. and most other countries, the land costs are implicit and involve few cash outlays, i.e., are opportunity costs that are important in the long-run but that does not affect production decisions in the short-run. To the extent that land is rented or where the owner is making mortgage payments, however, explicit land costs are incurred and can be a very significant factor in the cost of production and competitiveness.[10] U.S. cost of production data for most crops in recent years indicate that the returns on equity, including land and other owned resources are zero or negative, i.e., the prices of many farm products are too low to cover total costs when opportunity costs are included as part of the cost of production. Thus, land costs may not be a significant factor in competitiveness in the current policy framework where government payments are a significant part of the net returns of farm operators.

Endnotes

1. Alaska and Hawaii are not included in the average for the U.S. since they were not states at the time the series was established and they are excluded to prevent distortions in the historical series.

2.The EWG is an environmental Non-Government Organization (NGO) which obtained the data on farm program payments by recipient from the USDA under the Freedom of Information Act and published it on the EWG website (http://www.ewg.org).

3.Average rental rates for corn during the period 1996-2001, however, were relatively constant, varying only from 60 to 65 cents per bushel.

4. Although they carried out analyses for other crops including wheat, where Argentina is a major world competitor, the ERS study did not include cost estimates for crops other than soybeans.

5.While land renting is permitted in most EU countries there is considerable regulation of the practice with controls varying from almost none to very strict regulations (see Ravenscroft, Gibbard and Markwell 1999).

6. Data from CANSIM (http://cansim2.statcan.ca/cgi-win/CNSMCGI.EXE).

7. Data from ABARE (http://agsurf.abareconomics.com/cgi-in/abare.pl?_PROGRAM =ags4Home&wh=ter&pr=agsurf).

8.Michigan had a farmland assessment program, but abolished when it also abolished the property tax as a primary source for financing local schools.

9. While the U.S. programs were developed primarily as farmland preservation activities (Conklin 1980), the Canadian programs are justified, at least in part, on the basis that the taxes are for services received and that since farmers receive less services in proportion to the taxes paid (based on market values), fairness and equity mean that they should be taxed less than similarly valued urban properties (Groenewegen 2000, p. 3-4).

10. Goodwin, Mishra and Ortallo-Magné (2003, p. 744, note 1) indicate that land rental is common in the U.S. with some 45-50 percent of the land operated by non-0owners. However, Roberts, Kirwan and Hopkins (2003, p. 762), at the same AAEA session, indicate that "about 60 percent of the U.S. farmland is owned by non-operators."

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