Staff paper
82-48

ECONOMIC PROBLEMS OF PRODUCING AND MARKETING CORN*

THE UNITED STATES PERSPECTIVE

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INTRODUCTION

This paper will first review the basic characteristics of the U.S. corn industry. Emphasis will be placed on production patterns, the demand situation and the differences that exist among major U.S. production regions. Furthermore, the paper will confine its attention to the economics and marketing problems of dent corn which is used for grain. The paper will not address the problems of specialized corn such as sweetcorn and popcorn.

Secondly, this paper will examine some of the major economic and marketing decisions facing corn producers. Because the author most closely works with corn producers in the state of Michigan, this discussion will lean towards using Michigan examples for illustration purposes. Michigan is part of the Lake States. However, Michigan corn production closely parallels that of the Corn-Belt States.

THE U.S. CORN INDUSTRY

Production of corn in 1981 was the number one field crop grown in the United States. In 1981 there were 30.1 million hectares of corn harvested. Of the total tillable hectares harvested, corn accounted for

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* Paper presented at the Symposium uber Probleme der Erzeugung und Verwertung von Kornermais, Justus - Liebig - Universitat Giessen, May 18-19, 1982.

21 percent. In terms of world production, the U.S. produces nearly half of the total production.

Corn is produced in all parts of the U.S. (See Figure 1.) The major production areas are the Corn Belt, the Lake States, and the Northern Plains states. These states account for 46, 17, 16 percent of the hectares planted respectively.

Corn is grown for both grain and as a source of livestock roughage (silage). Table 1. illustrates the production pattern for both of these uses. The hectares of corn harvested for grain dropped 20 percent from the early 1950s to the late 1960s. This reflects a period of surplus corn in the United States. Since that time it has slowly trended upward and is now at the level of the 1950s. This recent growth reflects the expansion of markets for corn made possible by a growth in export demand.

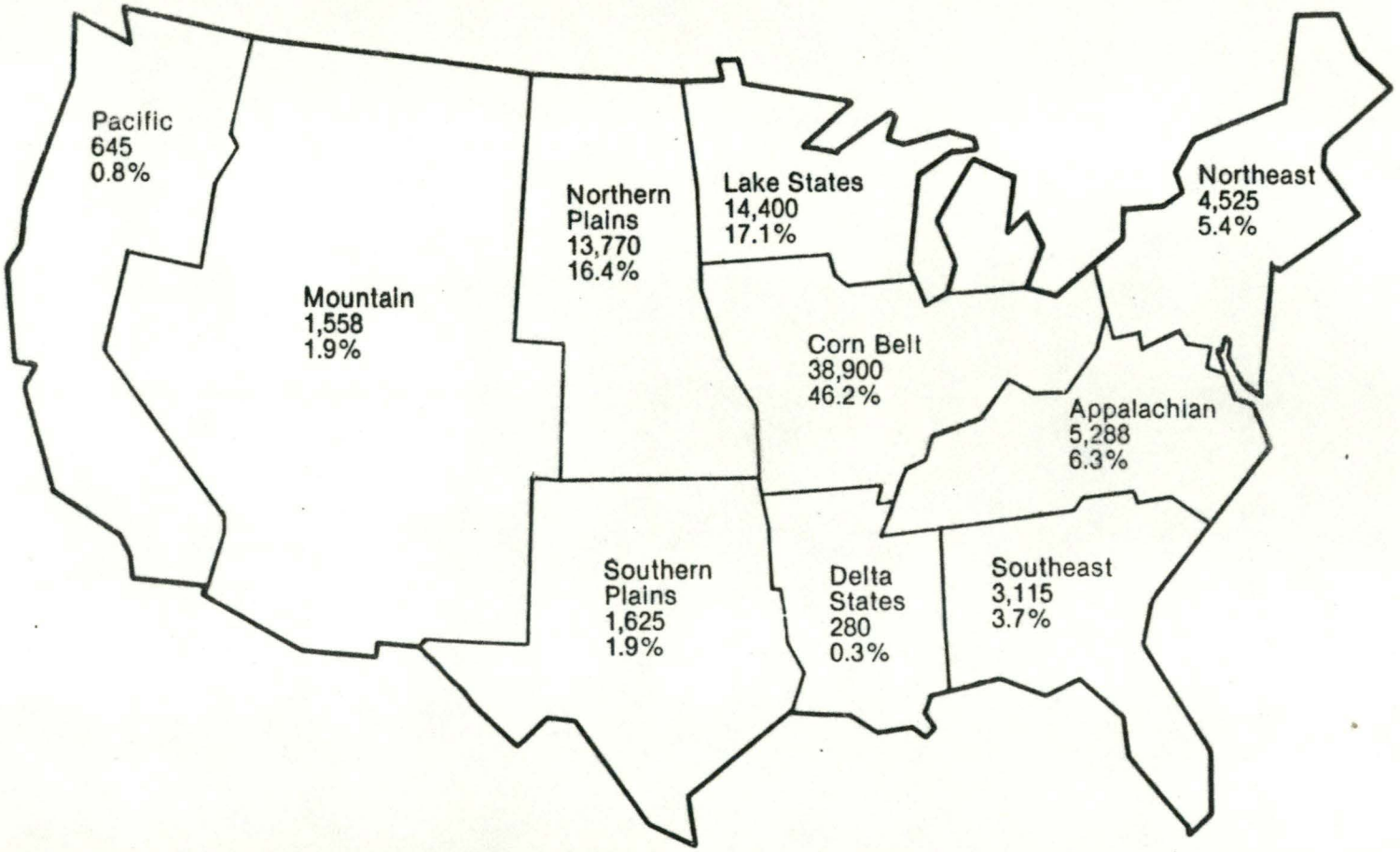
From the early '50s to the early 1980s, the yield for corn has increased from 2.47 to 6.92 metric tons per hectare. This is a 100 percent increase for this period. This increase has been accomplished by adopting new production practices and technologies including high yielding hybrids, higher fertilization and seeding rates, improved control methods for pests and increased irrigation in certain regions of the U.S.

Overall production has grown significantly from the 1950s to the 1980s. Today the U.S. is producing nearly three times as much corn for grain as in the 1950s.

It should be noted that the rate of growth in yields has leveled off in recent years. For example, the percentage increase in yields from the early to the late 1950s was 23.6 percent. Between the early

FIGURE 1. U.S. CORN PRODUCTION AREAS.

Acreage of Corn Planted for All Purposes in 1980 *



*The top number in each region refers to acreage planted (unit = 1,000 acres), and bottom number refers to percentage of total acreage.

SOURCE: "U.S. Corn Industry," USDA Agricultural Economics Report No. 479, 1982.

Table 1. CORN ACREAGE, YIELD, AND PRODUCTION

Crop year	Harvested for grain			Harvested for silage		
	Area	Yield per Hectare	Production	Area	Yield per Hectare	Production
	Million Hectare	Metric Tons	Million Metric Tons	Million Hectare	Metric Tons	Million Metric Tons
Aver. 1950-4	28.7	2.47	71.0	2.3	16.91	38.9
Aver. 1955-9	26.9	3.05	82.1	2.7	18.67	50.4
Aver. 1960-4	23.9	3.96	94.6	3.0	22.70	68.1
1965	22.5	4.63	104.2	3.2	23.97	76.7
1966	23.1	4.58	105.8	3.2	25.47	81.5
1967	24.6	5.2	123.5	3.4	25.35	86.2
1968	22.7	4.98	113.1	3.2	26.63	85.2
1969	22.1	5.39	119.1	3.2	28.19	90.2
1970	23.3	4.53	105.5	3.2	26.66	85.3
1971	25.9	5.54	143.4	3.5	28.40	99.4
1972	23.3	6.08	141.7	3.3	30.12	99.4
1973	25.1	5.74	144.0	3.6	28.86	103.9
1974	26.5	4.51	119.4	4.3	24.47	105.2
1975	27.4	5.42	148.4	3.9	27.05	105.5
1976	29.0	5.51	159.8	4.5	23.93	107.7
1977	29.0	5.70	165.3	3.7	28.92	107.0
1978	29.2	6.32	184.6	3.4	31.59	107.4
1979	29.4	6.86	201.6	3.2	32.63	104.4
1980	29.6	5.71	168.9	3.7	27.30	101.0
1981	30.1	6.92	208.3	3.3	32.0	105.6

SOURCES: U.S.D.A., Agricultural Statistics, various issues. U.S.D.A., Crop Production Annual Summary, Crop Reporting Board, Econ. Stat. Coop. Serv., selected issues.

and late 1970s the percentage increase was at a lower level of 13.2 percent. One possible explanation for this decline is related to the fact that the less productive land was removed from production in the 1950s as the areq planted to corn declined. In the 1970s as the area planted increased, the reverse condition occurred. Another assumed reason which

is often used to explain this decline is that the easy advances in productivity have already been exploited. Furthermore, if there are not new technological breakthroughs occurring in the near future--such as the hybrid varieties which were introduced earlier--the rate of growth in yields may continue to grow at a decreasing rate. Genetic engineering and/or the application of computer technology are assumed by many to be the necessary breakthroughs to insure new increases in productivity.

Corn harvest for silage accounts for a much smaller proportion of the hectares planted to corn. Corn for this usage has doubled in the past 25 years. Silage is generally used as a feedstuff for ruminant animals. The dairy industry has particularly trended towards feeding more corn silage and less of the other roughage sources. Also, the growth in cattle fed has added to this growth. As with corn for grain, the yields have grown significantly for the same basic reasons. The combined effect of increased area planted to silage and higher yields has resulted in approximately a 3.5 growth factor from the early 1950s to the early 1980s.

Corn Disappearance

Corn is used for a variety of purposes. Corn for livestock feed is the major use of corn in the U.S. In the 1980-1981 year feed usage was 85 percent of the total U.S. utilization of corn (see Table 2). Approximately 60 percent of the corn used for feed purposes was actually fed to livestock on the farm on which the corn was produced. This is an indication of the integration of crops and the livestock sectors in U.S. agriculture. Many farmers in the U.S. see corn as an intermediate product and the final product is often a form of livestock sales. The swine industry is the largest user of corn 1980-1981 (see Table 3).

Dairy animals and beef cattle are also large consumers of corn.

Table 2. U. S. CORN DISAPPEARANCE, BY USE
1950 - 1981

Year beginning Oct. 1	Domestic use					Exports	Total Disappearance
	Food and Industry	Alcoholic Beverages	Seed	Feed	Total		
	Million Metric Tons						
Aver. 1950/55	4.7	1.5	0.4	61.0	67.3	2.8	70.0
Aver. 1955/60	6.4	1.9	.4	66.7	73.6	4.9	78.5
Aver. 1960/65	6.3	1.7	.4	78.5	86.8	11.3	98.0
1965/70	7.0	1.8	.3	85.6	94.7	17.5	112.2
1966/67	7.2	1.9	.4	84.6	94.1	12.4	106.5
1967/68	7.4	1.9	.3	89.7	98.9	16.1	115.0
1968/69	6.9	1.9	.3	91.8	100.9	13.6	114.6
1969/70	7.1	1.9	.3	97.3	106.6	15.6	122.2
1970/71	7.6	1.8	.4	91.4	101.2	13.2	114.4
1971/72	8.2	1.8	.4	101.3	111.8	20.3	132.0
1972/73	9.1	1.9	.4	109.2	120.7	32.0	152.7
1973/74	9.5	2.0	.5	106.4	118.4	31.6	150.1
1974/75	10.5	1.7	.5	80.9	93.6	29.2	122.8
1975/76	11.0	1.8	.5	90.9	104.2	43.5	147.7
1976/77	11.6	1.9	.5	90.9	104.9	42.9	147.7
1977/78	12.7	1.8	.5	95.3	110.3	49.6	159.9
1978/79	13.5	1.8	.5	110.0	125.8	54.3	180.1
1979/80	14.8	1.8	.5	115.0	132.2	61.9	194.1
1980/81	16.7	1.9	.5	105.0	124.1	59.9	184.1

SOURCES: U.S.D.A. Agricultural Statistics, various issues; U.S.D.A. Feed Situation, Econ. Stat. Coop. Serv., selected issues.

Domestic use of corn for alcoholic beverages and seed is relatively small. Corn use for feed and industrial purposes is the other large domestic utilization of corn. There has been a steady trend upwards in this usage (see Table 2). In terms of food usage, the major growth has been the use of corn as a source of sweeteners. There has also been a growth in the use of corn on the industrial side, particularly as it is

used in the production of alcohol fuels. However, with the recent surplus in world oil production, the interest of using corn as a liquid fuel source has declined. Even at higher oil prices, alcohol fuels needed a subsidy to be price competitive. Today, the subsidy needs to be even larger.

Table 3. CONSUMPTION OF CORN BY LIVESTOCK TYPE 1980-81[a]

Livestock	Million Metric Tons[b]	% of total
Hogs	38.4	38
Dairy Animals	17.5	17
Cattle on Feed	17.8	17
Other beef Cattle	6.2	6
Chickens	10.8	10
Broilers	9.8	9
Turkeys	2.4	2
Other Livestock	1.5	1
Total	104.4	100

[a]Year beginning October 1
[b]Preliminary figures
SOURCE: Adapted from U.S. Corn Industry, U.S.D.A. Ag. Econ. Report No. 479, 1982.

A major market for U.S. produced corn is the export market. There has been a steady trend upward in exports from the early 1950s to the 1980s. There was an exceptionally large increase in exports in the early 1970s and since this point in time exports have increased approximately 15 percent annually.

Overall, world trade in corn has more than doubled in the 1970s. Furthermore, the international supply of corn is significantly influenced by a relatively small number of countries (see Table 4). The United States accounted for 78 percent of the world corn exports in 1980-1981. Argentina was the next largest corn exporter with a 7

percent share.

Table 4. WORLD CORN EXPORTS
1970-1981

Fiscal Year beginning July 1	United States	Argentina	South Africa	Western Europe	Other	World
	1,000 metric tons					
1970/71	13,078	5,333	915	4,637	5,882	29,845
1971/72	16,719	4,801	2,829	4,787	4,274	33,410
1972/73	28,892	2,832	3,181	4,210	4,833	43,948
1973/74	34,853	5,105	371	6,400	8,132	54,861
1974/75	28,384	5,831	3,324	5,114	8,729	51,382
1975/76	39,590	2,595	1,353	5,718	11,290	60,546
1976/77	42,348	4,384	1,366	4,741	5,537	58,376
1977/78	45,085	5,995	2,697	4,371	4,582	62,730
1978/79	51,246	6,664	2,722	4,700	4,218	69,550
1979/80	62,115	4,063	2,689	4,607	4,422	77,896
1980/81	64,702	5,837	3,500	4,453	4,049	82,541

SOURCE: U.S. Department of Agriculture, Foreign Agricultural Circular, Grains, Foreign Agricultural Service, Selected Issues.

The world imports of corn are shown in Table 5. Although the U.S. exports to nearly 100 countries, the EC, Japan, and the USSR are the largest importers of U.S. produced corn. These three destinations account for approximately 60 percent of U.S. exports.

Because exports are such a large component of U.S. disappearance of corn, modest variations in export demand has a major impact on the price structure of U.S. corn. Relatively small movements in the world supply of coarse grains, which include corn, can cause a large movement in the U.S. price of corn. This point will be discussed in greater detail later in this paper.

Table 5. WORLD CORN IMPORTS[a]
1970-1981

Fiscal Year beginning July 1	Western Europe	Japan	USSR and Eastern Europe	Other	World
		1,000 metric tons			
1970/71	18,071	5,173	1,728	4,203	29,175
1971/72	19,144	5,416	3,526	3,919	32,005
1972/73	20,435	6,881	6,916	7,558	41,790
1973/74	24,859	8,210	6,654	10,348	50,071
1974/75	24,957	7,388	6,082	9,119	47,546
1975/76	22,578	7,879	16,266	8,345	55,068
1976/77	29,133	8,874	10,018	10,053	58,078
1977/78	24,156	9,717	15,130	11,979	60,982
1978/79	24,590	10,936	14,636	18,472	68,634
1979/80	23,823	11,876	22,859	20,328	78,886
1980/81	23,793	13,900	18,025	23,787	79,505

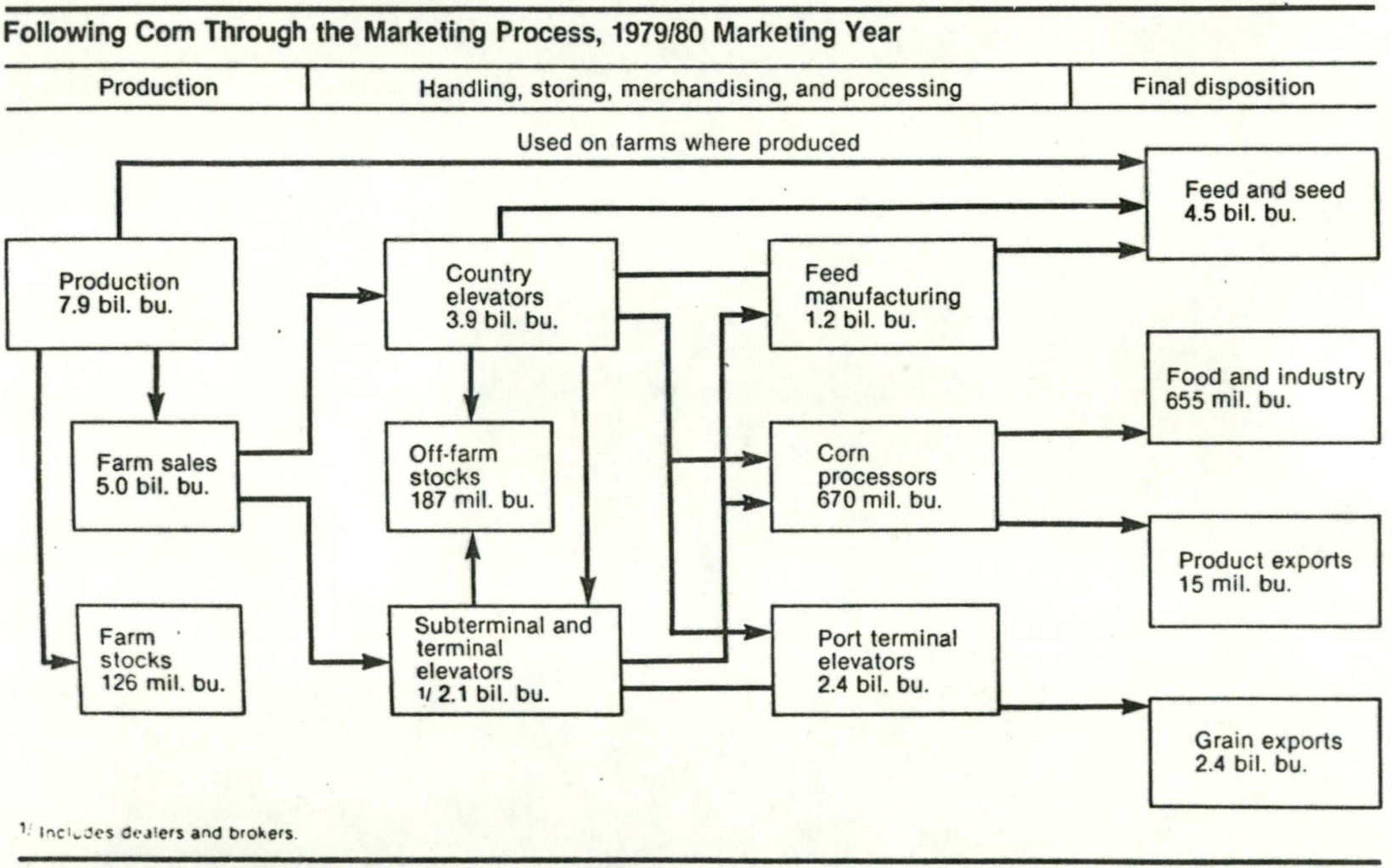
[a]The total volume exported each year (Table 4) is not totally accounted for in reports from importing countries. Consequently, total exports in a particular fiscal year usually exceed total imports.
SOURCE: U.S. Department of Agriculture, Foreign Agricultural Circular, Grains, Foreign Agricultural Service, Selected Issues.

Marketing System

As discussed previously, over 35 percent of the corn produced is used on farms where it was grown with a major proportion being used for livestock feed. Corn that was sold flows predominately through country, subterminal, and terminal elevators to either feed manufacturing or port terminals for export (see Figure 2).

Although Figure 2 illustrates the flow of corn in the marketing system, it does not reflect who actually has control of corn stocks. As shown in Table 6, the grain stocks and storage capacity are weighted in favor of on-farm facilities as opposed to off-farm facilities. For the most part, grains stored in on-farm facilities are under the control of the producer or controlled by government commodity program regulations

FIGURE 2. U.S. CORN MARKETING CHANNELS.



SOURCE: "U.S. Corn Industry," USDA Agricultural Economics Report No. 479, 1982.

if the farmer has elected to participate in such programs.

Table 6. U.S. GRAIN STORAGE CAPACITY PRODUCTION AND STOCKS Jan. 1, 1980

Item	Million Metric Tons
Storage Capacity (Corn Equiv.)	
On-Farm Facilities	253.2
Off-Farm Facilities	180.5
Total	433.7
Production, 1979	
Corn	202.1
Soybeans	61.9
Other Grains	96.3
Total	360.3
Grain Stocks (Corn Equiv.)	
On-Farm	203.4
Off-Farm	104.2
Total	307.6

SOURCE: Adapted from U.S. Corn Industry, U.S.D.A. Ag. Econ. Report No. 479, 1982.

In discussing the marketing system for corn, it should be briefly noted that the corn pricing system is a complex one. In addition to local markets (e.g., country, subterminal, or terminal elevators) available to farmers who sell their crops, there also exist several organized grain exchanges or trades. Government commodity programs also have a direct influence on the marketing and pricing systems.

The primary market for trading corn is the Chicago Board of Trade. The bulk of corn trading on this market is with the futures market. Futures market trading differs from cash transactions in that the commodity is sold for delivery at a specified date into the future. Local

marketing channels also offer similar future sales options to farmers. These marketing options will be discussed in greater detail later in the paper.

The Government feed grain programs have a major impact on U.S. corn prices. These programs have traditionally established a lower level for U.S. corn prices which is equal to the Government set loan rate (see Figure 3). The loan rate is a guaranteed price for corn for those farmers who have elected to participate in the program. In the 1960s the loan price essentially set the price of corn. However, in the 1970s the loan rate had only limited effects of corn prices. Although the Government feed grain programs have served as a stabilizing force on corn prices, they have also functioned as a supply controlling instrument by requiring farms to reduce the area planted to feed grains.

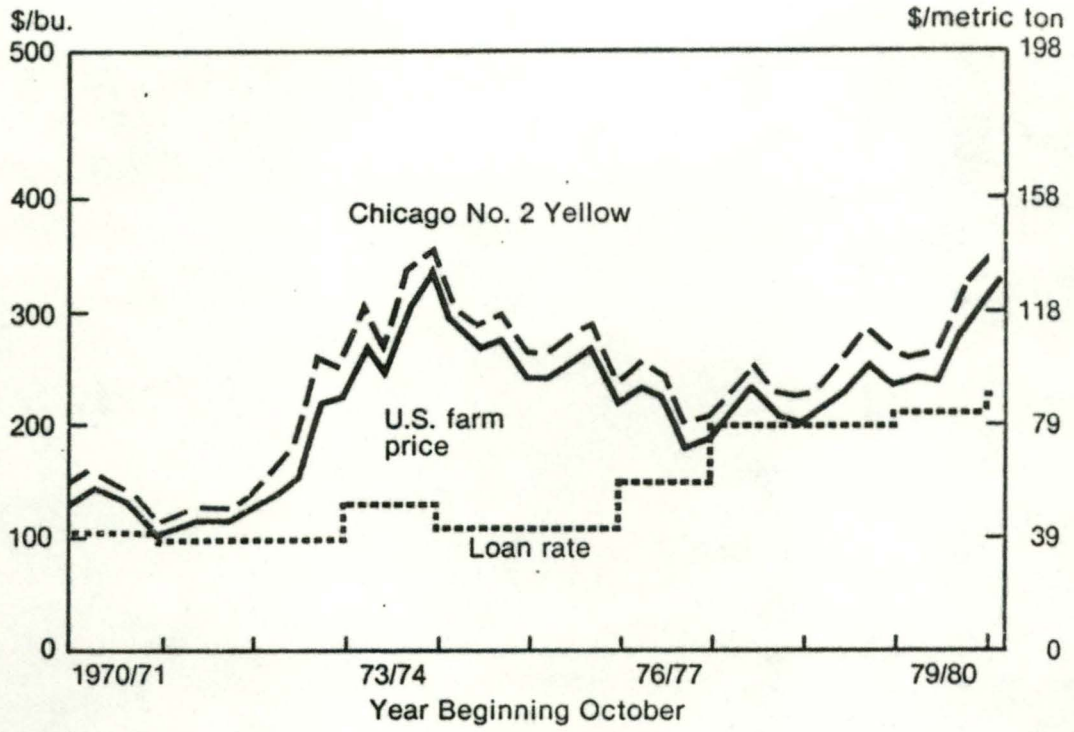
The Structure of Agriculture

Understanding the structure of U.S. Agriculture is an important component to understanding the economic problems of the corn industry. The percentage of total population living on farms has declined from 60 percent in 1920 to 16 percent in 1980. Similar trends can be noted for farm employment. These shifts have resulted in a decline in the number of farms and a growth in farm size. Today the average farm is slightly larger than 165 hectars.

It should be noted that farms vary greatly in size. However, the larger farms produce a major proportion of the total sales. Farms with $40,000 or more gross sales accounted for 81 percent of total sales in 1978. Smaller farms often use off-farm income to supplement farm income

A crop farm (corn/soybeans) with over $40,000 gross sales in 1974 had assets in excess of $250,000. Today, the assets will be signifi-

Figure 3. CORN PRICES AND LOAN RATES
1970-79



SOURCE: U.S. Corn Industry, U.S.D.A. Ag. Econ. Report No. 479, 1982.

cantly larger. The debt for these farms is relatively small, approximately 12 percent of assets.

In terms of owernship patterns for farm and ranch land, 88.1 percent of the 6.9 million owners were either sole peoprietors or husband-wife co-owners in 1978. Another 7.4 percent were family partnerships or family corporations. The remaining 4.5 percent of the owners are non-family partnerships or corporations. However, this latter group accounts for 9.7 percent of the farm and ranch land.

Finally, various government units have major land holdings. The U.S. government is by far the largest holder. However, most of these holdings are non-agricultural (eg., forest, park, etc.) in nature.

ECONOMIC AND MARKETING PROBLEMS OF CORN PRODUCTION
THE PRODUCER VIEWPOINT

Boetlinger classifies decisions as either being tactical or strategic. Strategic decisions are long run in nature and are infrequently made. The longest period of time worth considering is used. The manager is primarily concerned with goals and broad selection of means. Strategic decisions are broad in scope, have long-term effects, are more difficult to reverse and have a more major impact on the overall agricultural operation. In a sense, strategic decisions relate to the general game plan (e.g., assembling a soccer team which is weighted towards players having strong offensive skills and less towards those with defensive skills).

In contrast, tactical decisions are frequently made and are based on a shorter time period. Tactical decisions are a means of implementing and modifying the strategic game plan (e.g., using a four-man front line).

Strategic Decisions

For the corn producers, strategic decisions would include deciding which other enterprises should complement the corn production enterprises, what functions should be performed on the farm (e.g., should the farm have its own drying and storage facilities and manage its own marketing program) and how large the farm businesses should be.

Enterprise Combinations

Farms in the United States have become increasingly more specialized. However, this trend towards specialization in recent years has slowed. Farmers chose to retain some diversity because it is a means to address risk, achieve better utilization of resources, solve technical production problems, comply with institutional constraints, and fulfill personal preferences.

Diversification is a common means for a farmer to reduce variance in farm income. Production of several crops reduces the chances of having a complete failure. If income on one enterprise fails, it may be offset by good income levels in the other enterprises. To make the risk management strategy function correctly, careful attention must be given to combining enterprises such that they will have no offsetting impact on each other. One of the reasons used for integrated livestock production on corn producing farms is the stabilizing effect the livestock income has on income variability (e.g., if corn prices are low, feeding corn to the hogs is often a means of obtaining a higher value from the corn produced). As noted earlier, over 35 percent of the corn produced is actually fed on the farm on which it was produced.

Other enterprises, particularly cropping enterprises, are often associated with corn production because it leads to a better utilization of resources. For example, the major "bottlenecks" for corn production are in the early spring -- time for land preparation and planting -- and late fall -- time for land preparation and harvesting. Machinery, labor, and the other resources needed to accomplish the necessary field operations for corn production in these critical periods would be underutilized if not used by other enterprises during other time

periods. By integrating other cropping enterprises (e.g., soybeans into the farm cropping plan) the cost of acquiring these scarce resources can be shared. This concept will be illustrated later in this paper. It should also be noted that other crops are included on most U.S. corn farms because of cultural, technological, or institutional reasons. Although some soils in the U.S. can be continuously planted to corn, there are many that cannot or should not be used in this fashion. Thus, the other crops are needed for rotation purposes. Likewise, the Government commodity programs encourage the use of the other crops in the rotation plan.

Functions Performed

In recent years corn producers have been undertaking additional functional activities. This is particularly true of activities which follow harvesting. Corn producers today are involved in the conditioning, storage, and marketing of corn. This shift in functions performed has been mainly caused by adoption of new technology and changes in market conditions. In the 1960s nearly all corn was harvested by mechanical pickers and dried by natural air. Today, approximately 90 percent of the corn is harvested with a combine fitted with a corn head. Corn harvested by this means generally has to be conditioned by artificial drying. Much of the drying capacity and related storage capacity has been assumed by the corn producer (see Table 6).

A movement of corn prices above the government loan rate has also forced corn producers to become much more concerned with marketing programs and information (see Figure 3). The impact that changing corn prices has had on profitability of farms is monumental. Today, many farmers feel good marketing information is equally if not more so

important than technical information. New institution information transfer systems are being established to supply farmers with this information.

As more functional activities have been assumed by corn producers, others have been dropped. For example, some corn producers have moved from using custom operators to apply fertilizer and pesticides during critical time periods.

Size Of Operation

A common concern of economists is finding the most efficient size of operation. This is particularly true in the long run. The efficiency question as applied to crop farms has been a long standing interest of agricultural economists. Their interest is accentuated by the fact that a change in farm size needed to achieve long run, efficient farms will have a major impact on the structure of U.S. agriculture. This is particularly true as it relates to farm employment and the ownership of farms.

In the U.S. there has been a trend towards farms to either become larger or smaller. The smaller have grown in number because the operation of these farms is essentially a leisure time activity and off-farm employment is a major source of income for these farm operations. They remain competitive because they do not demand a high reward for their labor resources and are innovative in controlling costs (e.g., using new machinery).

In terms of larger commercial crop farms, the fact that these farms have continued to become larger is not primarily related to economies of size. A recent report by the USDA indicates its growth is more likely related to the other factors such as desiring to increase their levels

of income, control of resources (e.g., land) and as a means of achieving net worth growth. Indeed as Table 7 indicates, the size difference between the most economically sized operation (the one with the lowest long-run average cost curve) and a firm which achieves 90 percent of this efficiency is fairly large. The 90 percent efficient firm can be accomplished with a modest sized operation. However, there are significant differences in the level of employment of the operator on these farm operations and, therefore, a likely reason for the movement towards larger sized farms.

Table 7. SIZE AND EFFICIENCY
CORN BELT FARM
(Cropping Operation Only)

Factor	Size
Most Efficient Farm[a]	
Gross Income	145,000 Dollars
Crop Land	256 Hectares
Operator Labor Used	1,058 Hours
90% Efficient Farm	
Gross Income	60,000 Dollars
Crop Land	120 Hectares
Operator Labor Used	654 Hours
Income as Percentage of Efficient Farm	41 Percent

[a]Lowest long-run average cost curve.
SOURCE: Adopted from Tables 4, 5, and 6 of Economies of Size in U.S. Field Crop Farming, U.S.D.A. Agricultural Economics Report No. 472, 1981.

Tactical Decisions

Tactical decisions related to corn production and marketing include cost control, adjusting the cropping program to reflect the changing prices, resource availability, technological changes, and developing a marketing program. Options available under each of these tactical deci-

sion areas will be briefly discussed.

Cost Control

Controlling costs is a major concern of corn producers. It can make the difference between being profitable and being forced out of farming. In examining the area of cost control, it is important that one concentrate on those cost items that are of major importance. This is not to state that those items that are a small proportion of the overall cost are not important, but their relative impact on cost control will be less great. The major items of cost in the production of corn include fertilizer and lime, chemicals, equipment ownership, energy costs (fuel, lubrication and drying costs), and labor (see Table 8).

To control costs corn producers rely upon numerous sources of information. For example, the better corn producers test the soil to determine the residual levels of nutrients in the soil. This information is used to make fertilizer recommendations. In the case of nitrogen recommendations, an agronomic model may be utilized to determine the most economical level of nitrogen to apply based upon the soil analysis, past management practices (e.g., how manure has been applied) and the prices of nitrogen and corn. Interest in agronomic models has increased as the price of fertilizer increased sharply upward in the mid 1970s.

Chemicals are used primarily to control weeds and insects. In order to more effectively control pests and reduce the amount of chemicals applied to crops, integrated pest management projects have been initiated. These projects have given corn produces and the other crop producers economic threshold models to aid them in determining the correct timing and application levels needed to control pest problems. Many of these models can be run on programmable calculators or small

Table 8. ESTIMATED CORN PRODUCTION COSTS
CORN-BELT - LAKE STATES AND CENTRAL ILLINOIS
1979 and 1981

Cost Item	Corn Belt Lake States		Central Illinois[a]	
	$/Ht	$/MT	$/Ht	$/MT
	----1979----		----1981----	
VARIABLE				
Seed	31.55	4.27	44.48	4.85
Fertilizer and Lime	103.15	13.97	155.67	16.99
Chemicals	35.58	4.82	49.42	5.39
Custom Operations	9.88	1.34	15.96	1.74
All Labor	27.73	3.76	74.13	8.09
Fuel and Lubrication	23.08	3.13	37.88	4.13
Repairs	19.40	2.63	30.17	3.29
Drying	18.45	2.50	27.18	2.97
Interest	10.70	1.45	20.77	2.27
Sub-total Variable	279.52	37.87	455.66	49.72
MACHINERY OWNERSHIP				
Replacement	52.55	7.12	81.54	8.90
Interest	32.90	4.46	51.37	5.61
Taxes and Insurance	8.05	1.09	12.49	1.36
Sub-total Machinery	93.50	12.67	145.40	15.87
MANAGEMENT AND OVERHEAD				
Farm Overhead	19.23	2.61	125.39	13.69
Management Change	39.23	5.31	0	0
Sub-total Mngt. and O.H.	58.46	7.92	125.39	13.69
Total (Excluding Land)	431.48	58.46	726.45	79.28
LAND CHANGE				
Current Value	311.33	42.18		
Aver. Acquisition Value	169.05	22.90		
Taxes and Rent	0	0	281.69	30.74

[a]The numbers of these studies are not directly comparable. Thus some adjustments were made in numbers to make them more comparable.

SOURCE: Adapted from U.S. Corn Industry, U.S.D.A. Ag. Econ. Report No. 479, 1982 and "Cost of Growing Corn and Soybeans, 1981, Farm Economics Facts and Opinions, University of Illinois, April, 1982.

computers.

Energy costs have become a major proportion of corn production

expenses. This has caused corn producers to adopt energy saving technology. There has been a sharp trend towards using minimum and/or conservation tillage methods. For example, the use of chisel plows rather than moldboard plows is an energy saving tillage practice. As discussed earlier, fertilizer and chemicals, which are energy based, are now being more precisely applied to meet needs.

Grain drying is also an energy intensive operation. Significant research has been directed towards building more energy efficient drying systems. In areas with high levels of reliable solar energy, solar drying systems are being utilized. However, there are major parts of the prime corn production areas that do not have adequate and/or reliable solar energy. In these areas solar drying systems are not economical. Other methods for improving energy efficiency for fossil fuel based drying systems include air recycling, use of concurrent flow systems, low temperature drying, and multistage drying systems.

As drying systems have become more energy efficient, they have also reduced the likelihood of degrading the quality of grain. With the movement to artificial drying systems, there has been a decrease in grain quality. In particular, artificial dried corn has a tendency to have a higher proportion of kernels become broken in storage and transportation than natural dried corn. Some of these new drying systems have greatly reduced the potential of broken kernels.

Machinery ownership costs are a major component of corn production costs. It has become a major cost item because of the shift through time to higher levels of mechanization and less labor intensive operations. Today, a common problem for corn producers is to have the right amount and size of equipment in relationship to the other resources. In

a later section of this paper, an illustration of a computer model which is commonly used to balance resources for corn producers will be used to illustrate the process of balancing machinery to other resources.

How to establish the appropriate costs related to the crop land resource is a major concern of corn producers. Land values for the past nearly 50 years have trended upward except for a few years. However, with today's high land prices and an unusually high rate of interest, it is, in most cases, not possible for a corn producer with the gross margin (gross income less cash expenditures) on corn to cover the opportunity cost of the capital invested in land. For these reasons land charges at current values, average acquisition values, and taxes plus rental rate are shown. The established farmer will obviously view land costs differently than the young farmer attempting to establish himself and farming. Indeed, all farmers are starting to re-evaluate land prices. With the recent narrowing of corn income and cost of production and with higher interest rates, it has been observed that land prices are starting to decline significantly. A recent study in Illinois indicates a 12.5 percent decline in land prices in the past year.

Finally in terms of cost control, Table 8 illustrates that costs have increased significantly in the past few yesrs. Recent U.S.D.A. figures indicate costs per metric ton have increased by 60 percent from 1978 to 1981. During this same period returns have essentially held constant or declined. This has placed many corn producers in a serious financial bind. Indeed, many corn producers which are carrying heavy debt obligations and/or are inefficient will be forced from farming unless the "cost-price squeeze" lessens in the near future.

Adjusting to a Changing Environment

Corn producers are constantly confronted with changing conditions. The price relationship between corn and other crops may change. Or, alternatively, the corn producer may have the opportunity to rent additional land. Will his machinery be capable of handling this additional land?

To assist the corn producer in addressing these problems, computer models have been developed. One such model is TELPLAN Program 18, The Crop Farm Planning Guide. To use this model the crop farm manager needs to supply information on land availability, expected yields under ideal planting and harvesting conditions, machinery resources available, labor available for field operations--adjusted for weather conditions--for each of the critical time periods, and commodity prices.

Once this information has been collected, the manager would access the computer by a remote terminal and enter the information as prompted by the computer. Once the information has been entered and verified for accuracy, the model, using linear programming, will find a cropping plan which is tailored to his situation. An example run for a Michigan farmer is shown in Figure 4.

This analysis gives the manager details on crops to be grown by land type, expected yields, and a suggested marketing plan. It also gives the manager a schedule of operations. Finally, it gives the manager an indication of scarce resources. In this case harvesting capacity is inadequate and thus causing harvesting operations to be performed in non-ideal time periods.

This model is designed to easily do sensitivity analyses. For example, if the crop farmer would purchase a combine with 30 percent

FIGURE 4. TELPLAN OUTPUT

BE READY FOR OUTPUT OF ANALYSIS 1
TELPLAN PROGRAM 18

* PROFITABILITY *

1. RETURNS ABOVE VAR COST = $ 81553.
   VAR COST = $ 81804.

* CORN ACRES AND SALES *

2. ACRES OWNED LAND = 171.
   AVER BU/ACRE =117.6
   TOTAL BUSHELS = 20117.
3. ACRES RENTED LAND = 138.
   AVER BU/ACRE =101.0
   TOTAL BUSHELS = 13964.
4. BU CORN SALES AT HARVEST = 3791.
   BU CORN SALES AT SPRING = 30290.

* SOYBEAN ACRES AND SALES *

5. ACRES OWNED LAND = 154.
   AVER BU/ACRE = 37.3
   TOTAL BUSHELS = 5740.
6. ACRES RENTED LAND = 124.
   AVER BU/ACRE = 32.0
   TOTAL BUSHELS = 3970.
7. BU SOY SALES AT HARVEST = 0.
   BU SOY SALES AT SPRING = 9710.

* CORN PLANT AND HARVEST SCHEDULE *

21. OWNED LAND SCHEDULE

	ACRES HARVESTED				
ACRES PLANTED	SEP 27 OCT 03	OCT 04 OCT 10	OCT 11 OCT 17	OCT 18 NOV 07	NOV 08 NOV 28
APR 25-MAY 10	0.	0.	0.	171.	0.

27. RENTED LAND SCHEDULE

	ACRES HARVESTED				
ACRES PLANTED	SEP 27 OCT 03	OCT 04 OCT 10	OCT 11 OCT 17	OCT 18 NOV 07	NOV 08 NOV 28
APR 25-MAY 10	0.	0.	21.	30.	87.

* SOYBEAN PLANT AND HARVEST SCHEDULE *

33. OWNED LAND SCHEDULE

	ACRES HARVESTED				
ACRES PLANTED	SEP 27 OCT 03	OCT 04 OCT 10	OCT 11 OCT 17	OCT 18 NOV 07	NOV 08 NOV 28
MAY 19-MAY 26	101.	53.	0.	0.	0.

39. RENTED LAND SCHEDULE

	ACRES HARVESTED				
ACRES PLANTED	SEP 27 OCT 03	OCT 04 OCT 10	OCT 11 OCT 17	OCT 18 NOV 07	NOV 08 NOV 28
MAY 27-JUN 03	0.	0.	76.	0.	0.
JUN 04-JUN 11	0.	48.	0.	0.	0.

41. LAND PREPARATION SCHEDULE (AC)

SEP 27-OCT 17	19.	MAY 11-MAY 18	81.
OCT 18-NOV 07	35.	MAY 19-MAY 26	73.
NOV 08-NOV 28	38.	MAY 27-JUN 03	76.
APR 01-APR 24	178.	JUN 04-JUN 11	48.
APR 25-MAY 10	39.		

*VALUE OF SCARCE RESOURCES *

50. OWNED LAND ($/AC) 82.79
    RENTED LAND ($/AC) 0.0

51. PREPARATION TIME ($/HR)

SEP 27-OCT 17	143.72
OCT 18-NOV 07	143.72
NOV 08-NOV 28	143.72
APR 01-APR 24	13.65
APR 25-MAY 10	13.65
MAY 11-MAY 18	6.56
MAY 19-MAY 26	6.56

52. PREPARED LAND FOR PLANTING ($/AC)

APR 25-MAY 10	5.05
MAY 11-MAY 18	2.43
MAY 19-MAY 26	2.43

53. PLANTING TIME ($/HR)

APR 25-MAY 10	13.65
MAY 19-MAY 26	6.56

54. HARVESTING CAPACITY ($/AC)

SEP 27-OCT 03	89.59
OCT 04-OCT 10	75.50
OCT 11-OCT 17	75.50
OCT 18-NOV 07	84.77
NOV 08-NOV 28	46.49

55. HARVEST TIME ($/HR)

SEP 27-OCT 03	266.09
OCT 04-OCT 10	224.24
OCT 11-OCT 17	224.24
OCT 18-NOV 07	251.76
NOV 08-NOV 28	176.65

more capacity he would be increasing returns above variable costs by $6,423 annually. These returns should offset the expenses of the larger machine. Other adjustments can be easily evaluated as well.

Models of this nature are extremely helpful to crop farmers in making adjustments to changing conditions. With the advent of low cost small computers farmers will be making increasing use of these management tools.

Marketing

U.S. farmers have historically been more concerned with technological problems of production rather than marketing. In earlier times, the flexibility available to farmers in the marketing area were somewhat limited. Furthermore, until the mid 1970s Government commodity programs insured a stable corn price and thus formulation of a marketing program was fairly simple. With the sharp growth of exports in the early 1970s, corn prices have risen above the government loan rate for the decade of the 1970s except for a couple of years.

This heavy dependence upon the export market has introduced substantial variability in the farm price of corn. Work by Ferris and others suggest that the price of U.S. corn is heavily influenced by the yields (see Table 9). Since the variability in coarse grain yields outside the U.S. is greater than the variability in U.S. corn yields, corn prices are more strongly influenced by coarse grain yields outside the U.S.

Today, a farmer with a poor marketing program can reduce his net income as easily as poor cost control. To compound the situation, marketing options open to farmers are large and include the following:

Table 9. IMPACT OF COARSE GRAIN YIELDS ON THE U.S. PRICE OF 1982 CORN CROP

U.S. Corn Yields (MT/HA)		Yield of Coarse Grain Outside U.S. (MT/HA)				
		1.70-1.74	1.74-1.78	1.78-1.82	1.82-1.86	1.86-1.90
	Probability	.046	.273	.364	.227	.091
		U.S. Farm Price Of Corn ($/MT)				
5.65-5.90	.046	158+	158+	145	128	116
5.90-6.15	.091	158+	150	128	120	104
6.15-6.40	.227	157	134	125	110	100
6.40-6.65	.227	141	128	113	104	98
6.65-6.90	.227	128	118	104	98	94
6.90-7.15	.091	122	108	98	94	94
7.15-7.41	.091	112	102	98	94	94

SOURCE: Probability Forecasts on U.S. Corn Prices, Agricultural Economics Staff Paper No. 82-4, Michigan State University, 1982.

(1) Cash Market -- This is the immediate delivery of the commodity for sale.

(2) Forward Contract -- This is the delivery of a commodity at a negotiated future time at a specified price.

(3) Futures Contract -- This is a legally binding commitment to deliver or take delivery of a given quantity and quality of a commodity, at a price agreed upon when the contract is made with the delivery at the sellers option sometime during the specified delivery month. The corn producer generally does not actually deliver the product but uses the futures contract as a hedging tool -- taking an opposite risk position in the market -- to establish a price position at a future point in time.

(4) Delayed Pricing -- This is an option in which the producer delivers the commodity to the cash market and subsequently gives title to the commodity merchant. The producer reserves the right to select the date of sale. The price received is the cash price prevailing at that specified date.

(5) Basis Pricing -- This is a contract to price a commodity at a fixed discount (or premium) to a given futures contract. Timing is determined by the producer as with delayed pricing.

(6) Government Programs -- This is a set of options which sets a minimum price and/or return (which is generally based on a historical yield and estimated cost of production) for the crop producer. In exchange for this guaranteed price and/or return, the producer is often required to remove a proportion of his land from production.

With all the marketing options available to corn producers, there is a need for more timely information regarding market conditions. Today many corn producers are enrolling in marketing workshops. These workshops teach farmers how to react to changing market conditions and chose the appropriate marketing strategies to meet their goals. In some cases marketing models which simulate markets are used to give the corn producers "real world" experiences.

Farmers are also turning to new delivery systems for market information. Because of the timeliness of market information, computer based delivery systems are being employed. Not only is the marketing information more timely, these systems also tend to give a more indepth analysis of the markets. There are several computerized market systems available for corn producers. In Michigan, Michigan State UNiversity is

delivering market information via of COMNET (Computerized communications system) to farmer, extension agents and agribusiness. An example of the type of information delivered is show in Figure 5.

SUMMARY

This paper has briefly reviewed the structure of the U.S. corn industry. It noted that corn is a major crop in the U.S. and that corn yields have trended upward over time. The major usage of corn is for feeding livestock. Exports are also a major market for corn. The market system for corn is a complex one with numerous marketing options available to the corn producer.

The corn producer is confronted with a great number of economic problems. He needs to be concerned with the proper enterprise mix, determining to ideal siz of operation, cost control, making adjustments to changing conditions (e.g., price movements) and formulating a marketing program. Those that address these economic problems with sound logic will likely remain competitive and efficient in the years ahead.

FIGURE 5. COMNET MARKET INFORMATION.

Date 5/06/82
Analyst Ferris

Weekly Market Analysis (WMA)
CORN ($/bu)

Futures	Closing	Fundamental Forecast	Technical			Near Term Price Move	Action Recommended
			MA	P&F	Chart		
May 1982	2.72	2.80					Consider cash
July 1982	2.81	2.95	-	+	NC	NC	sales. Basis
Dec. 1982	2.85	2.95	-	+	NC	NC	is extremely
Mar. 1983	2.98	3.10					narrow. Delay
May 1983	3.05	3.22					pricing new crop, especially if in farm program.

Old Crop: Current cash price mid Michigan 2.48

July basis .33 Breakeven July basis* .53-.61

Regular loan 2.40 Reserve loan 2.55 Reserve trigger 3.15

New Crop: Cost of production 2.55-3.05 Normal Dec basis at harvest .60

Hedge opportunity 2.25 cash contract for Oct.-Nov delivery 2.28

Regular loan 2.55 Target 2.70 Reserve loan 2.90

Reserve trigger 3.25

Commentary:

Excellent planting weather and easing of the Falkland crisis put pressure on corn futures. Technical signs which have been positive since late March have turned negative or indeterminate.

Positive influences on the market have been the export pace and the sign-up under the Acreage Reduction Program. In the week ending April 29, 51 million bushels of corn were shipped in comparison with a 42 million bushel rate needed to meet the USDA's projection. Conrad Leslie estimates planted corn acreage in 11 states down 5 percent, in line with our estimates.

*Assumes the normal July basis in late June is .45 and storage costs are .04-.08 per bushel per month.

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CORN ($/bu)

Futures	Closing	Fundamental Forecast	Technical			Near Term Price Move	Action Recommended
			MA	P&F	Chart		
May 1982	2.72	2.80					Consider cash sales. Basis is extremely narrow. Delay pricing new crop, especially if in farm program.
July 1982	2.81	2.95	-	+	NC	NC	
Dec. 1982	2.85	2.95	-	+	NC	NC	
Mar. 1983	2.98	3.10					
May 1983	3.05	3.22					

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* CORN PLANT AND HARVEST SCHEDULE *

21. OWNED LAND SCHEDULE

	ACRES HARVESTED				
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APR 25-MAY 10	0.	0.	0.	171.	0.

27. RENTED LAND SCHEDULE

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* SOYBEAN PLANT AND HARVEST SCHEDULE *

33. OWNED LAND SCHEDULE

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ACRES PLANTED	SEP 27 OCT 03	OCT 04 OCT 10	OCT 11 OCT 17	OCT 18 NOV 07	NOV 08 NOV 28
MAY 19-MAY 26	101.	53.	0.	0.	0.

39. RENTED LAND SCHEDULE

	ACRES HARVESTED				
ACRES PLANTED	SEP 27 OCT 03	OCT 04 OCT 10	OCT 11 OCT 17	OCT 18 NOV 07	NOV 08 NOV 28
MAY 27-JUN 03	0.	0.	76.	0.	0.
JUN 04-JUN 11	0.	48.	0.	0.	0.

41. LAND PREPARATION SCHEDULE (AC)

SEP 27-OCT 17	19.	MAY 11-MAY 18	81.
OCT 18-NOV 07	35.	MAY 19-MAY 26	73.
NOV 08-NOV 28	38.	MAY 27-JUN 03	76.
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APR 25-MAY 10	39.		

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    RENTED LAND ($/AC) 0.0

51. PREPARATION TIME ($/HR)

SEP 27-OCT 17	143.72
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APR 01-APR 24	13.65
APR 25-MAY 10	13.65
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