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Price Determination in Agricultural Commodity Markets: A Primer

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Summary

This report provides a general description of price determination in major U.S. agricultural commodity markets for wheat, rice, corn, soybeans, and cotton. Understanding the fundamentals of commodity market price formation is critical to evaluating the potential effects of government policies and programs (existing or proposed), as well as of trade agreements that may open U.S. borders to foreign competitors. In addition, an understanding of the interplay of market forces over time contributes to flexibility in making policy for what may be short-term market phenomena. The general price level of an agricultural commodity, whether at a major terminal, port, or commodity futures exchange, is influenced by a variety of market forces that can alter the current or expected balance between supply and demand. Many of these forces emanate from domestic food, feed, and industrial-use markets and include consumer preferences and the changing needs of end users; factors affecting the production processes (e.g., weather, input costs, pests, diseases, etc.); relative prices of crops that can substitute in either production or consumption; government policies; and factors affecting storage and transportation. International market conditions are also important depending on the "openness" of a country's domestic market to international competition, and the degree to which a country engages in international trade.

A distinguishing feature of U.S. commodity markets is the importance of futures markets. Unlike cash markets which deal with the immediate transfer of goods, a futures market is based on buying (or selling) commodity contracts at a fixed price for potential physical delivery at some future date. A futures exchange provides the facilities for buyers and sellers to trade commodity futures contracts openly, and reports any market transactions to the public. As a result of this activity, futures markets function as a central exchange for domestic and international market information and as a primary mechanism for price discovery, particularly for storable agricultural commodities with seasonal production patterns.

The U.S. Department of Agriculture (USDA) plays a critical role in monitoring and disseminating agricultural market information. Commodity markets rely heavily on USDA reports for guidance on U.S. and international supply and demand conditions. The release of USDA supply and demand estimates has the potential to substantially alter market expectations about current and future commodity market conditions and are, therefore, closely watched by market participants.

In general, certain characteristics of agricultural product markets set them apart from most non-agricultural product markets and tend to make agricultural product prices more volatile than are the prices of most nonfarm goods and services. Three such noteworthy characteristics of agricultural crops include the seasonality of production, the derived nature of their demand, and generally price-inelastic demand and supply functions. In addition, wheat, rice, corn, soybeans, and cotton each have certain unique structural characteristics that further differentiate the nature of market price formation from each other. This report will be updated as conditions warrant.

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Price Determination in Agricultural Commodity Markets: A Primer

Introduction

This report focuses on the major factors affecting price formation for the five largest U.S. program crops—wheat, rice, corn, soybeans, and cotton.[1] According to the U.S. Agricultural Census, these five crops accounted for 67% of harvested crop land in the United States in 2002.[2] Certain common characteristics make a general description of market price formation relevant across this diverse set of commodities: each of these crops is produced annually; under modest conditions they are all storable for long periods of time (potentially spanning several years); they all move from farm to market in bulk form; and they are all actively traded on at least one of the major commodity futures exchanges which facilitates hedging and forward contracting. In addition, frequently several or (in some cases) all of them compete for the same crop land in production, thus, indirectly linking their prices across markets.

This report begins by briefly introducing some economic fundamentals common to most agricultural commodity markets. This is followed in the second section by a discussion of the role of futures markets in price determination of storable agricultural commodities with seasonal production patterns. The third section reviews the important role provided by the U.S. Department of Agriculture (USDA) in monitoring and disseminating agricultural market information. The release of timely information facilitates price discovery and helps to level the playing field between small market participants and the large multinational agri-businesses. The fourth and final section highlights some of the differences unique to each of these commodities that make price determination in each market somewhat different.

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[1] Other U.S. feed grain crops (primarily grain sorghum, barley, and oats) are briefly mentioned in the discussion of corn as the principal U.S. feed grain crop. Other U.S. oilseeds crops (primarily sunflowers, rapeseed, canola, peanuts, and cottonseed) are briefly mentioned in the discussion of soybeans as the principal U.S. oilseed crop.

[2] For more information see the "2002 Census of Agriculture United States" available at [http://www.nass.usda.gov/Census_of_Agriculture/index.asp].

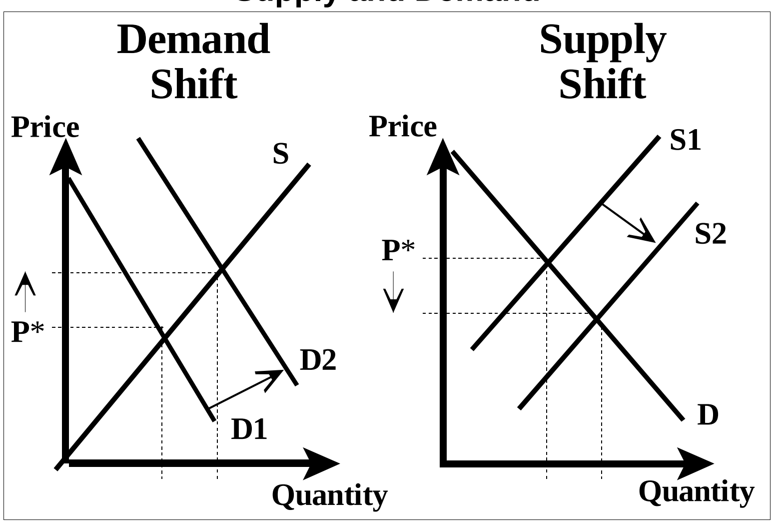
Agricultural Commodity Market Fundamentals

Market Structure and Prices

Price (P*) represents the equilibrium point where buyers (i.e., demand) and sellers (i.e., supply) meet in the marketplace (**Figure 1**). New market information (e.g., crop failure in a foreign market, widespread animal disease outbreak, a major revision to a previous crop production estimate, etc.) can alter the expectations of market participants and lead to a new equilibrium price as sellers revise their offer prices and buyers revise their purchase bids based on the new information.

An outward shift in demand from the market equilibrium (due, for example, to news of a foreign crop failure raising expectations for increased U.S. exports) would raise the price P* as Demand moves to the right along the Supply curve. Similarly, an outward shift in supply from the market equilibrium (due, for example, to an upward revision in the planted acreage estimate by USDA raising expectations for higher production) would lead to lower price P* as Supply moves to the right along the Demand curve. Both of these hypothetical price changes would only be short-term. In the long-run, producers would alter their planting decisions in light of the new price expectations.

Figure 1. Price Represents the Equilibrium of Supply and Demand



The speed and efficiency with which the various price adjustments occur depend, in large part, on the market structure within which a commodity is being traded. Common attributes of market structure include the following.

- The number of buyers and sellers—more market participants are generally associated with increased price competitiveness.

- The commodity's homogeneity in terms of type, variety, quality, and end-use characteristics—greater product differentiation is generally associated with greater price differences among products and markets.

- The number of close substitutes—more close substitutes means buyers have greater choice and are more price sensitive.

- The commodity's storability—greater storability gives the seller more options in terms of when and under what conditions to sell his products.

- The transparency of price formation, e.g., open auction versus private contracts—greater transparency prevents price manipulation.

- The ease of commodity transfer between buyers and sellers and among markets—greater mobility limits spatial price differences.

- Artificial restrictions on the market processes, e.g., government policies or market collusion from a major participant—more artificial restrictions tend to prevent the price from reaching its natural equilibrium level. Some restrictions (e.g., import barriers) limit supply and keep prices high, while other types of restrictions (e.g., market collusion by a few large buyers) may suppress market prices.

What's Behind Market Price Differences

The general price level of an agricultural commodity, whether at a major terminal, port, or commodity futures exchange, is influenced by a variety of market forces that can alter the current or expected balance between supply and demand. Many of these forces emanate from domestic food, feed, and industrial-use markets and include consumer preferences and the changing needs of end users; factors affecting the production processes (e.g., weather, input costs, pests, diseases, etc.); relative prices of crops that can substitute in either production or consumption; government policies; and factors affecting storage and transportation. International market conditions are also important depending on the "openness" of a country's domestic market to international competition, and the degree to which a country engages in international trade.

Local Supply and Demand Conditions. Differences in grain and oilseed prices throughout the world reflect differences in local supply and demand conditions (as well as differences in local market structures). In general, grain and oilseed prices are lower in the inland producing regions where they are in surplus, and higher in grain and oilseed deficit, densely populated and port regions where demand exceeds local production. Similarly for cotton, prices are lowest in the production zones, and highest around processing centers and textile mills.

Product Characteristics. Today's market participants tend to be very sophisticated buyers who carefully compare the price of different agricultural commodities in terms of their cost per unit of desired end-use characteristic. As a result, supply and demand conditions in agricultural markets—whether it be markets for export, feed rations, fresh products, food processing, or textile manufacturing—may depend on a commodity's particular variety, quality, or end-use characteristic more than the overall supply of the generic commodity. For example, a flour processor may base wheat purchase decisions primarily on the specific variety of wheat and its particular milling and baking characteristics. A yarn or textile manufacturer may select cotton based on its fiber color, strength, or length depending on the intended processing outcome. A livestock or poultry operation strives for the least-cost, balanced ration (depending on the type of animal) that includes sufficient protein, carbohydrates, fats, vitamins, and roughage. An ethanol plant may select corn based on its starch content, while a food processor may prefer corn with an above-average oil content.

Transfer Costs. Key components of the U.S. grain and oilseed handling network include on-farm storage, trucks, railroads, barges, and grain elevators (including county, sub-terminal, and export elevators). A complex web of local supply and demand conditions determines how and when commodities move through this network. Price changes at any point along the chain can result in shifts to alternate transport modes or routes as grain marketers search for the lowest-cost method of moving grain between buyer and seller.

For grains and oilseeds, prices at the local country elevator are derived from a central market price less transportation and handling costs. Country elevator managers watch the prices in several markets (whether a processing plant, feedlot, export terminal, or futures exchange) to determine where the demand is the greatest, then deduct transfer costs to the higher-priced market in determining the bids they can offer local producers. In competitive markets, transfer costs—loading or handling and transportation charges—are usually the most important factors in determining spatial (i.e., location-based) price differentials. In the international marketplace, transfer costs include barriers to trade such as tariffs and quotas. The more it costs to transport a commodity to a buyer, the less the producer will receive and vice versa. Price differentials between regions cannot exceed transfer costs for very long as marketers will quickly move commodities from the low-priced markets (raising prices there) and ship them to the higher-priced markets (lowering prices there).[3]

From the farm to the processing plant or export terminal, trucks, trains, and barges compete and complement one another in moving grain to successively larger elevators. Shipping distance often determines each mode's particular role. Trucks traditionally have an advantage in moving grain for shorter distances (less than 250 to 500 miles) and therefore function primarily as the short haul gatherers of grain product. Railroads have a cost advantage in moving grain long distances, but barges have an even greater cost advantage where a waterway is available.[4] Most

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[3] Stephen Amosson, Jim Mintert, William Tierney, and Mark Waller, *Knowing and Managing Grain Basis*, RM2-3.0, 6-98, Texas Agricultural Extension Service.

[4] For a discussion of agricultural transportation issues and the cost advantages of barge versus truck or rail, see CRS Report RL32470, *Upper Mississippi River-Illinois Waterway Navigation Expansion: An Agricultural Transportation and Environmental Context*,

(continued...)

economists and market analysts agree that inexpensive barge transportation helps hold down rates charged by the rail and truck transportation industries.

Any disruption to the agricultural transportation network generally results in higher transportation costs throughout the system as the demand for transportation services shifts to alternate modes and routes in search of the next best means of moving production to market. For example, a weather event that dramatically slows or severely limits barge traffic on the Mississippi River will have the effect of raising barge freight rates as the demand for barge services exceeds their supply. Higher barge freight rates for grains will in turn shift these commodities to alternate uses (feed, food, industrial, or storage), to alternate transport modes (rail or truck), or to alternate trade routes (e.g., to the Atlantic via the St. Lawrence Seaway, or overland to Canada, Mexico, or alternate ports along the Gulf coast or as far away as the Pacific Northwest). Because truck and rail are significantly more costly than barge transport, shifting bulk commodities to truck- or rail-based routes can substantially raise the cost of moving grain and result in a widening basis and falling prices in interior positions.

Government Policies. Several of the major field crops grown in the United States (including wheat, corn, barley, sorghum, oats, rice, soybeans, peanuts, and cotton) receive support under different types of government programs.[5] Annual direct commodity payments have averaged over $18 billion in the United States during the eight-year period, 1998/1999 to 2005/2006.[6] The intended function of government programs vary from direct price support under commodity loan provisions to conservation management. Because of their influence on per-acre returns, government programs play an important role in the crop selection and marketing decisions of agricultural producers.

The degree of influence of government programs varies greatly from commodity to commodity. But, in general, government programs increase the incentives to produce the crop receiving support. As a result, the supply of government-supported crops available to the market tends to be larger than the supply actually demanded by the market under the supply and demand conditions that would prevail in the absence of government programs. The consequence of over-supply is lower price.

The United States is not alone in the support it provides through government programs to its agricultural sector.[7] Most of the other major agricultural producing countries provide some form of support, although in many cases it is in the form of

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[4] (...continued)
coordinated by Randy Schnepf, pp. 27-34.

[5] For a brief introduction to U.S. agricultural programs see CRS Report RS20848, *Farm Commodity Programs: A Short Primer*, by Geoffrey S. Becker.

[6] Fiscal year data; USDA, Farm Service Agency, Budget Table 35, "CCC Net Outlays by Commodity and Function," available at [http://www.fsa.usda.gov/dam/bud/bud1.htm].

[7] For more information on the type and extent of foreign intervention in domestic agricultural sectors see CRS Report RL30612, *Agriculture in the WTO: Member Spending on Domestic Support*, by Randy Schnepf.

border protection (via tariffs, quotas, and other import restrictions), state-sanctioned monopolies (e.g., the Canadian Wheat Board), rural infrastructure development, or agricultural research rather than direct payments.

Key Role of Market Information

Commodity prices reflect the equilibrium between supply and demand at a particular location for a given moment in time. However, the market equilibrium and its associated price level are constantly changing as new information is received by market participants. The tremendous breadth of relevant information spanning global markets would appear to give an advantage to the large multi-national agricultural-based companies such as Cargill, Archer Daniels Midland, and Bunge that have employees monitoring crop and market conditions in all of the major grain and oilseed producing countries worldwide. However, there are three principal sources of market information (described briefly below) that at least partially offset the information advantage of the large multinational agri-corporations.

Agricultural Commodity Futures Markets. Commodity futures markets function as a central exchange for domestic and international market information and as a primary mechanism for price discovery. Because they reflect domestic and international market conditions, futures contract price movements implicitly convey information about international supply and demand conditions. This price-based market information function is described in more detail below in the section "Commodity Futures Markets."

U.S. Department of Agriculture (USDA). USDA attempts to level the "information" playing field for market participants by publishing timely U.S. and international crop supply, demand, and price projections for major U.S. program crops, as well as for several livestock production activities. USDA's market information reporting process is described in more detail below in the section "USDA Market Information."

Private News Services. In addition to USDA's commodity market information activities, a large network of private sector, fee-based agricultural market news and information services (including weather information services and commodity market reporting services) have developed since the early 1970s to complement and enhance USDA's commodity reporting.

Commodity Futures Markets

Overview

A distinguishing feature of the U.S. and international commodity markets is the importance of futures markets. Unlike cash markets which deal with the immediate transfer of goods, a futures market is based on buying (or selling) commodity contracts at a fixed price for potential physical delivery at some future date.[8] Agricultural commodity futures contracts are traded on several commodity exchanges in the United States and overseas (**Appendix Tables 1 and 2**).

Each exchange publishes information on the months for which futures contracts are available, the contract size, deliverable grades, trading hours, contract period, minimum price fluctuations, daily price limits, and margin information.[9] A futures contract specifies the grade, quality, amount, and conditions for product delivery, as well as the delivery month. In most cases, various product grades are deliverable in lieu of the contract's base grade or type, but subject to price premiums and/or discounts. The contract specifications are written to ensure that they closely mirror cash market conditions, and the months of trading are usually selected because of their significance in the crop marketing year.[10]

A futures exchange provides the facilities for buyers and sellers to trade commodity futures contracts openly, then reports any market transactions to the public. Most futures exchanges publish daily information on the open, high, low, and closing price of active futures contracts, as well as on their volume (reported as either the number of contracts or the total of physical units such as bushels traded) and open interest (the total number of futures contracts that have been entered into and not yet liquidated by an offsetting transaction or fulfilled by delivery).[11]

As a result of this activity, futures markets function as a central exchange for domestic and international market information and as a primary mechanism for price discovery. The reliability of a futures market's price discovery function is dependent on the volume of daily transactions. Thinly traded markets, as indicated by low volume, are more susceptible to price manipulation than are heavily traded ones. In such situations, prices on the futures market may not accurately reflect either price behavior in the cash market or expectations about the future.[12] It is not unusual for distant contracts—that is, futures contracts whose delivery date is a year or more in the future—to experience very low volume.

Publicly announced futures prices also play a critical role in facilitating seasonal market operations because they provide a forum for forward contracting and

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[8] For information on U.S. futures exchanges and the rules and regulations for trading commodity futures see the Commodity Futures Trading Commission (CFTC) website at [http://www.cftc.gov/].

[9] See **Appendix Table 1** for futures exchange websites where contract specifications and other relevant information is posted.

[10] *Handbook of Futures Markets*, "Chapter 26—Wheat," by Donna Nielsen Murphy, Copyright ©1984 by John Wiley & Sons, Inc., p. 11.

[11] For more information on futures market terminology see, "The CFTC Glossary," CFTC, available at [http://www.cftc.gov/opa/glossary/opaglossary_a.htm].

[12] Douglas Gordon, "Performance of Thin Futures Markets: Rice and Sunflower Seed Futures," *Agricultural Economics Research*, vol. 36, no. 4, fall 1984, pp. 1-27.

hedging.[13] Regional and local grain elevators rely on futures commodity exchanges for hedging grain purchases and generally set their grain bid prices at a discount to a nearby futures contract in areas of surplus production, (such as for corn in the Corn Belt) or at a premium in deficit production areas (such as for corn in North Carolina). As a result, cash prices and futures contract prices are strongly linked, i.e., both prices contain much of the same information about market conditions.

The Price Basis

A key price relationship between the local cash price and the price for the nearby futures contract is called the basis. The basis is defined as the difference between the cash price of a particular commodity at a specific location and the nearby futures contract (i.e., closest contract month) for that commodity. For example, the basis for soft red wheat in Peoria, Illinois, on a given day in June would be the difference between the cash price in Peoria and the July futures contract price at the Chicago Board of Trade (CBOT) as quoted on that same day.

Under normal supply and demand conditions, the basis for a storable commodity is negative reflecting the transportation cost associated with moving the commodity from the local market to the futures exchange, and the carrying charges (storage, interest and insurance costs) associated with holding the commodity during the time period separating the futures contract transaction date and the delivery (or contract expiry) date. (See **Figure 2**.) As a futures contract expires and the delivery month approaches, the carrying charges go to zero and the cash and futures prices tend to converge. At the date of actual delivery, the basis represents the pure transportation cost separating the local market from the futures exchange.

In cases where local demand exceeds local supply, whether due to a crop shortfall or a nearby processing plant, the basis may be less than the transport margin or even exceed the futures market price. For example, local corn demand may be bolstered by the existence of an ethanol plant or a major livestock feeding operation. Geographic basis distributions demonstrate that local corn prices in the southern plains states (with large cattle feeding operations) and eastern seaboard states (with widespread dairy and poultry feeding operations) routinely exceed the price of the nearby CBOT corn futures contract (i.e., an inverted basis) by as much as 10 to 20 cents per bushel due to strong local demand from livestock and poultry feeding operations; whereas local corn prices in the primary corn growing regions of the northern and western Corn Belt average 30 to 40 cents below CBOT corn futures prices.[14]

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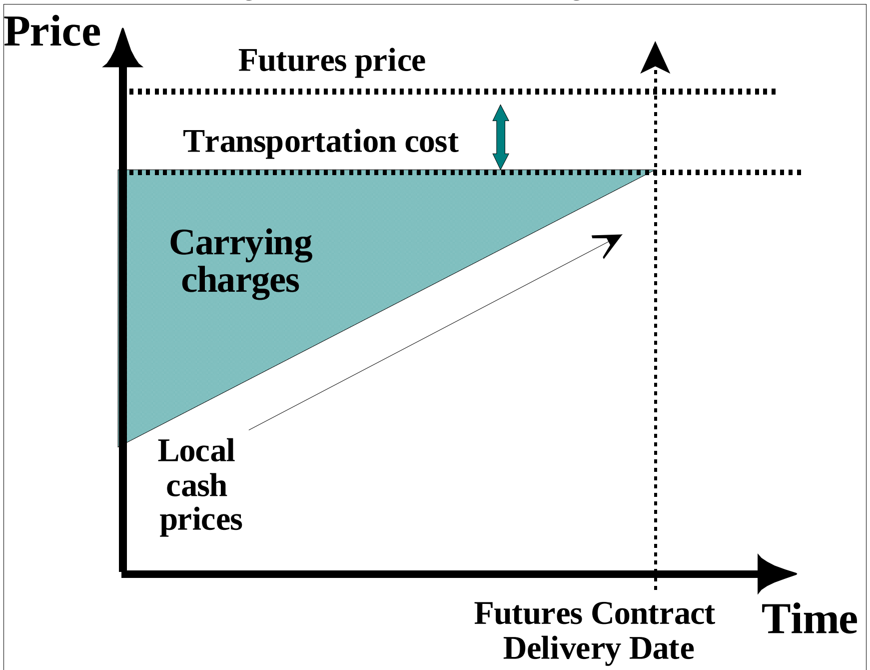
[13] See the CRS glossary *Agriculture: A Glossary of Terms, Programs, and Laws*, web version, for definitions of "forward contracting" and "hedging" available at [http://www.congress.gov/erp/lists/agglossary.html].

[14] For a geographic mapping of corn, soybean, and wheat basis distributions see "January 2004 Spatial Basis Report," by Kevin McNew and Duane Griffith, Briefing No. 64, Agricultural Marketing Policy Center, Montana State University, February 2004 at [http://www.ampc.montana.edu/publications/AMPCpublications.html].

Figure 2. Basis Convergence



Source: *Commodity Trading Manual*, ©Chicago Board of Trade, 1985, p. 65.

Full carrying charges are rarely ever achieved in actual market behavior, except in periods of substantial oversupply or excess stocks. However, the generally repetitive patterns of the basis movements for storable agricultural commodities make the basis more predictable from year to year than the movement of either cash or futures prices.[15] As a result, the basis enables producers and users to estimate an expected cash price from the currently reported value of a futures contract. This predictability greatly reduces the risk of using the futures market to hedge or forward contract.

Major Factors Influencing the Basis. Factors affecting the local basis for grains, oilseeds, and cotton are similar to the factors affecting both cash and futures prices and include 1) the overall supply and demand for each commodity by variety or type; 2) the supply and demand of other commodities that compete for either the same land in production or the same dollar of consumer expenditure; 3) geographical disparities in supply and demand; 4) transportation and transportation problems; 5) transportation pricing structure; 6) available storage space; 7) quality factors; and 8) market expectations.[16]

Inter-Contract Price Spreads

The price relationships that exist between differing futures contract months for the same commodity are called inter-contract (or intra-market) price spreads. Under

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[15] *Commodity Trading Manual*, ©Board of Trade of the City of Chicago, 1985, pp. 68-70.

[16] Ibid., p. 64.

normal supply and demand conditions, more deferred futures contracts have a premium over nearby contracts that reflects the carrying charges of holding the commodity until the deferred contract dates. For example, suppose that the hypothetical cost of carrying a $4.00 bushel of wheat for one month is 3 cents (calculated as: 6% annual interest charges for one month which equals 2 cents; plus insurance and other fees of 1 cent per bushel per month).[17] Then the premium (based strictly on carrying costs) between the September contract of the current year and next year's March contract would be 18 cents per bushel (calculated as: six months at 3 cents per month per bushel, equal to 18 cents).

However, "normal" conditions rarely persist and the market is always altering its expectations of future events as new market information becomes available. As a result, price differences between futures contracts rarely equate to simple carrying charges. During periods of supply shortage, cash prices tend to rise relative to futures contract prices, and nearby futures contract prices tend to rise relative to more distant contract months. As a result, both the basis and the price spreads between nearby and deferred contracts will narrow. If a severe scarcity develops, the carrying charges may disappear or actually become negative—a situation called an inverted market. Scarcity causes high prices in the cash and nearby futures contracts because the market gives priority to the present and discounts the future.

Old-Crop/New-Crop Price Spreads

While inverted markets resulting from severe scarcity are rare, a period of normal inversion (i.e., cash or nearby futures contract prices above more distant futures contract prices) frequently occurs between the last futures delivery month of one crop year (when marketable supplies are at their lowest point) and the first delivery month of the next crop year (when supplies are expected to be relatively abundant due to the new harvest).[18] This type of inversion is often referred to as the old-crop/new-crop inversion. For wheat, the old-crop/new-crop price spread is represented by the price difference between the May and July futures contracts; September and December contracts for corn; August and September contracts for soybeans; and July and October contracts for cotton.

As an example of how these price spread relationships may vary, consider the old-crop/new-crop price spreads at the three major U.S. wheat exchanges in the spring of 2004. On March 1, 2004, the May (04)-July (04) price spread for Hard Red Spring (HRS) wheat at the Minneapolis Grain Exchange settled at +4 cents per bushel indicating a relatively tight supply situation for high-protein spring wheat. In contrast, the May (04)-July (04) price spread for Hard Red Winter (HRW) wheat settled at -2 cents at the Kansas City Board of Trade (KCBOT), and at -2.5 cents for Soft Red Winter (SRW) wheat at the Chicago Board of Trade (CBOT). If carrying charges were the sole determinant then the May-June price spread would be about -5 to -6 cents per bushel. Instead, the KCBOT and CBOT old-crop/new-crop prices

[17] Actual carrying charges will vary with the commodity price level, the interest rate, and the fees associated with insurance and other time-related charges.

[18] A crop's marketing year is the 12-month period starting from the first harvest month in the crop's primary growing region.

spreads of -2 and -2.5 cents were less than the full carrying charges for the two-month time period separating the May and July contracts suggesting relatively tight supply conditions. However, the market conditions for HRW and SRW wheat appeared to be significantly less tight than for HRS which had an inverted basis of +4 cents. This example demonstrates how protein premiums plus differences in old-crop/new-crop supplies can cause market prices to vary across both time and location. Local elevator price bids based off of futures market contracts can be expected to follow a similar pattern of price differentials.

USDA Market Information

Introduction

USDA routinely releases a series of commodity market information reports to the public including U.S. and international crop and livestock production and commodity marketing activity for historical, current, and future time periods. USDA reports are released on a predetermined and publically announced schedule.[19] (See **Appendix Table 3**.) Commodity markets rely heavily on USDA reports for guidance on supply and demand conditions. Most private sector market news services design their own reports and activities around USDA data releases, and market watchers routinely offer their own "guesstimates" in advance of major USDA reports.

The crop estimates, projected supply and demand conditions, and farm price projections contained in USDA reports are used as benchmarks in the marketplace because of their comprehensive nature, objectivity, and timeliness. The release of USDA supply and demand estimates has the potential to substantially alter market expectations about current and future commodity market conditions and are, therefore, closely watched by market participants. On occasion, when USDA estimates represent a substantial deviation from market expectations concerning the supply and demand conditions for a particular commodity, significant price movement occurs.

An annual calendar is prepared in December of each year showing the date and hour of the coming year's data releases. The reports are released electronically from USDA headquarters in Washington, D.C. State statistical offices further facilitate transmission of the reports through local news releases and reports.

USDA relies on a formal structure for assembling and disseminating market information from across its various internal agencies.[20] The cornerstone of this

[19] The release schedule for USDA's 2006 reports is available at [http://www.whitehouse.gov/omb/inforeg/pei_calendar2006.pdf]. For more information on NASS operations and data collection methods see *Scope and Methods of the Statistical Reporting Service*, USDA, NASS, Misc. Publication, No. 1308, Revised Sept. 1983.

[20] For a brief description of the USDA agencies involved, the types of data used, and the structure used to prepare market forecasts, see USDA's Economic Research Service(ERS),

(continued...)

process is USDA's National Agricultural Statistics Service (NASS) which collects and publishes reports on an array of data on U.S. agricultural activities including crop area, yield, production, and growing conditions; livestock, poultry, and dairy production activities; input prices paid; farm prices received; and other agricultural data covering most agricultural activities undertaken in the United States.[21]

Crop Production Reports

For grains, oilseeds, and cotton grown in the United States, NASS publishes a number of reports which estimate the production of each commodity based on data collected from farm operations and field observations (see **Appendix Table 4**).[22] Monthly NASS *Crop Production* reports include estimates (for the nation and by major producing state) of harvested acreage, yield, and production. Crops included in each month's *Crop Production* report vary based on each crops seasonality of production.[23] Other crop-related NASS reports are released in accordance with each crops production cycle as described below and in **Appendix Tables 3 and 4**.

Estimates, Forecasts, and Projections. USDA's crop reporting schedule encompasses forecasts made during the growing season and estimates made after harvest. Forecasts and estimates represent two distinct concepts. Estimates generally refer to an accomplished fact, such as crop yields after the crop is harvested. In contrast, forecasts relate to an expected future occurrence (but generally within the crop year as supporting data is becoming available), such as crop yields expected prior to actual harvest of the crop based on available information such as current growing condition, measurements of fertilizer usage, etc. Projections are an extension of forecasts, but made further into the future—e.g., for the next crop year (T+1)—where no objective supporting information is available.[24] Instead, projections are based on extending historical supply and demand relationships, trade and demand patterns, and government policies into the future. Examples of projections include USDA's 10-year baseline projections which project commodity supply-and-use balances starting in the year T+1 and extending for an additional nine years into the future.

Crop Area. NASS conducts three major acreage surveys in any given year (T). The prospective plantings survey in March provides early indications of what farmers

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[20] (...continued)
Outlook Reports: USDA Outlook Process at [http://www.ers.usda.gov/publications/outlook/process.htm].

[21] For more information, visit NASS online at [http://www.nass.usda.gov]. NASS reports may be accessed at [http://www.usda.gov/nass/pubs/estindx.htm].

[22] For information on NASS crop production surveys and reports see *Understanding USDA Crop Forecasts*, USDA, NASS, Miscellaneous Publication, No. 1554, March 1999, available at [http://www.usda.gov/nass/nassinfo/pub1554.htm].

[23] NASS *Crop Production* reports are available at [http://usda.mannlib.cornell.edu/reports/nassr/field/pcp-bb/].

[24] For discussion purposes, T represents the current year; T-1 represents the preceding year; and T+1 represents the following year, often referred to as the outyear.

intend to plant; the midyear acreage survey, conducted in early June, is used to estimate spring-planted acreages and acreages for harvest; and the end-of-year acreage and production survey is conducted after most of the field crops have been harvested.

Prospective Plantings. Field crop planted-acreage intentions are based primarily on a survey—conducted during the first two weeks of March—of the current crop planting intentions for about 55,000 randomly-selected farm operators from across the United States. These estimates are published in the *Prospective Plantings* report scheduled for release at the end of each March (in accordance with a pre-announced schedule). The acreage estimates are intended to reflect grower planting intentions as of the survey period and give the first indication of potential plantings for the year. Actual plantings may vary from intentions in accordance with changes in weather or market conditions.

Acreage. Mid-year estimates for planted acreage are made based on surveys conducted in early June when field crop acreages have been established or planting intentions are firm. These estimates are published in the *Acreage* report scheduled for release at the end of each June. Winter wheat is an exception since seeding generally occurs during September-November of the preceding calendar year (T-1). The first forecast of winter wheat and rye planted area is released in January (T) in the *Winter Wheat and Rye Seedings* report. Any changes in winter wheat planted acreage estimates in the *Prospective Plantings* and *Acreage* reports are considered revisions.

Mid-year estimates of harvested acreage are based on reported acres for harvest for the earliest harvested crops, such as the small grains. The first forecast of the harvested acreage of winter wheat is published in the May release of the *Crop Production* report. The winter wheat planted and harvested acreage is subject to revisions in the June *Acreage* report. The first forecasts of harvested acreage for spring wheat is published in the July *Crop Production* report.

For the crops harvested later in the year, such as corn and soybeans, initial estimates make normal allowances for abandonment and acres used for other purposes. Estimates of acreage for harvest are subject to monthly revision, although they usually remain unchanged through the season. Current monthly acreage indications are obtained from the objective yield measurement program for corn, cotton, wheat, and soybeans and for other crops from special surveys conducted when unusual weather or economic conditions could affect the acreage to be harvested. For rice, cotton, oilseeds, and coarse grains, harvested acreage is first forecast in the August *Crop Production* report.

Yield and Production Forecasts. The first forecasts of yield and production are published in the May *Crop Production* report for fall-planted winter wheat (with monthly updates through October); in July for barley, oats, rye, durum, and spring wheat; and in August for the remaining field crops—corn, cotton, hay, oilseeds, peanuts, rice, sorghum, sugar cane, and sugar beets—with monthly updates through November. Cotton yield estimates are updated again in the December *Crop Production*.

Objective yield surveys are conducted during the principal growing season for cotton, corn, rice, sorghum, soybeans, and wheat in each commodities' major producing states. A forecast of prospective yield or production on a given date assumes that weather conditions and damage from insects, diseases, or other causes will be about normal (or the same as the average of previous years) during the remainder of the growing season. If any of these variables change, the final estimate may differ significantly from the earlier forecast.

Growing Conditions. In addition to the monthly *Crop Production* reports, NASS also publishes a weekly *Crop Progress* report during the principal growing season (April to November) including growing condition indexes for the major crops as well as pasture and forage conditions.[25] USDA, through its Joint Agricultural Weather Facility (JAWF), also publishes weekly information on U.S. and international weather in its *Weekly Weather and Crop Bulletin*.[26] These weekly reports on crop progress and conditions, as well as weather, provide a basis for evaluating crop yield prospects across the various global production zones for each commodity. As a result, they are closely watched and reported on by other secondary market information sources.

Year-End Estimates. Year-end estimates of acreage, yield, and production for barley, durum, oats, rye, and wheat are published in the *Small Grains Annual Summary*, released at the end of September (T). For all remaining field crops, year-end estimates of acreage, yield, and production are published in the *Crop Production Annual Summary* report the following January (T+1).

Market Demand Information

Demand for agricultural products originates from a broad range of sources including the livestock sector, food and industrial processors, and foreign markets. USDA informs agricultural markets about commodity demand conditions by publishing various reports on domestic use, trade, stocks, and prices for major agricultural commodities. The cornerstone of USDA market demand reports is the monthly *World Agricultural Supply and Demand Estimates* (*WASDE*) report—published by USDA's World Agricultural Outlook Board (WAOB) in collaboration with other USDA agencies.[27] The *WASDE* report is released simultaneously with the *Crop Production* report each month in order to incorporate new NASS production forecasts into the commodity supply and demand estimates. These estimates also combine and synthesize U.S. and foreign market information and government program information assembled by the various USDA agencies.

[25] *Crop Progress* reports are available at [http://usda.mannlib.cornell.edu/reports/nassr/field/pcr-bb/].

[26] *Weekly Weather and Crop Bulletin* are available at [http://www.usda.gov/oce/waob/jawf/wwcb.html].

[27] The *WASDE* report and information on the WAOB are available at [http://www.usda.gov/agency/oce/waob/].

In the *WASDE* report, data are assembled into brief supply and demand balances, complete with projections of the national average U.S. farm price received, for each of the major U.S. program crops (feed grains—corn, barley, sorghum, and oats; wheat by class; rice by grain length; soybeans and its products; sugar; and cotton) for both the United States and the world with breakouts by major foreign producer, consumer, or competitor as the case may be for each commodity. The *WASDE* report is supplemented by monthly commodity situation and outlook reports and annual data yearbooks for wheat, feed grains, rice, soybeans, and cotton—published by USDA's Economic Research Service (ERS)—which provide market analysis and more detailed supply and demand tables for these same crops.[28]

Domestic Use. Based on the particular commodity being monitored, domestic use may be broken into various sub-categories such as feed use, seed use, and food and industrial use. Market information for this diversity of potential demand sources is less survey-based and less systematic than the information provided by USDA's many crop-production related reports.

Stocks. The *Grain Stocks* report—published quarterly in January, March, June, and September by NASS is based on surveys of farmers and elevator operators. The *Grain Stocks* report covers all wheat, durum wheat, corn, sorghum, oats, barley, soybeans, flaxseed, canola, rapeseed, rye, sunflower, safflower, and mustard seed. A separate *Rice Stocks* report is issued in January, March, August, and October. These reports are closely watched by market observers as an important first indicator of U.S. domestic demand. Although the stocks report is intended to estimate the amount of grain stored on and off farms at different points during the marketing year, quarterly usage may be approximated as the difference between the current quarter's stocks and the previous quarter's stocks.

Feed Use. No survey of feed use is undertaken by USDA; however, several USDA reports provide information about the potential for feed demand as well as the prices and availability of substitute feeds. Three specific NASS reports—the monthly *Cattle on Feed* report, the quarterly *Hogs and Pigs* report, and the monthly *Poultry Slaughter* report—provide information about the location and sizes of animal populations during certain periods of the year. These reports are supplemented by the monthly *Livestock, Dairy, and Poultry Outlook* report published by ERS that presents detailed economic analysis of the implications of NASS livestock reports. The NASS *Weekly Weather and Crop Bulletin*, with its index on the quality of pastures, provides an indication of grazing availability—an important offset to feedlot use and feed demand.

Seed Use. Seed demand is directly related to plantings and will, therefore, move up or down with changes in the projections for crop area planted. However, seed use traditionally represents such a small portion of total disappearance that any changes to expected seed demand rarely, in and of themselves, elicit a market response. Both the *WASDE* report and ERS commodity outlook reports provide data on seed use for various (but not all) crops.

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[28] ERS commodity outlook reports are at [http://www.ers.usda.gov/publications/outlook/].

Food and Industrial Use. Projections of food and industrial use tend to be fairly stable and, therefore, more predictable than feed use or export demand. In most cases a simple trend line is used to predict future food and industrial demand levels. This results, in large part, because primary agricultural products usually represent only a very small portion of the final cost of most processed products, whether it be a food product such as a loaf of bread, a box of breakfast cereal, or a jar of baby food; or an industrial product such as soap or paint. As a result, changes in this demand category are rarely unexpected, and rarely produce unexpected market price movements.

Basic data for industrial use comes from the Census Bureau's survey of manufacturing industries which is issued every five years. Industry reports such as the *Milling and Baking News* provide information on demand for wheat and other cereals by food processing sector. Similarly, specific agricultural processor's associations, such as the National Oilseed Processors Association (NOPA), provide information on processing capacity and use. In recent years, federal support for ethanol production has promoted industrial use of corn and some sorghum.[29] However, this new demand is largely recognized by the marketplace (with announcements of financing and construction of new processing plants) well before it plays a role in boosting demand, thus mitigating its short-term price impact.

Export Demand. Since the market events of 1972, most market observers consider exports to be the great uncertainty underlying commodity supply, demand, and price forecasts.[30] In 1972, the Soviet Union made unexpected purchases of large amounts of U.S. grain. Prices for corn, wheat, and soybeans climbed to record-levels in 1973, then to still higher levels in 1974. Congress responded by mandating export sales reporting by USDA beginning in 1973.[31]

Today, there are three primary data sources which monitor the U.S. trade situation and underlie USDA projections of U.S. agricultural trade.

- The weekly *Export Sales* report published by USDA's Foreign Agricultural Service (FAS). The *Export Sales* report indicates the amounts of major U.S. agricultural commodities that have been exported, as well as outstanding sales which have been contracted for but not delivered, during the current marketing year compared with the same period from the previous marketing year.[32]

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[29] For more information on national and state programs that support corn-based ethanol production, see CRS Report RL32712 *Agriculture-Based Renewable Energy Production*, by Randy Schnepf.

[30] For a review of market events during 1972-1974 see, USDA, ERS, "Global Grain Markets in 1996: Shares of 1972-74?"by Pete Riley, *Agricultural Outlook*, Sept. 1996, pp. 2-6.

[31] More information on FAS' Export Sales Reporting Program is available at [http://www.fas.usda.gov/info/esrbrochure04/esrbrochure04.htm].

[32] The *Export Sales* report is available at [http://www.fas.usda.gov/export-sales/esrd1.asp].

- The weekly *Grains Inspected for Export* report issued by USDA's Agricultural Marketing Service and based on inspections undertaken by the Federal Grain Inspection Service of USDA's Grain Inspection, Packers, and Stockyards Administration.[33]

- The Census Bureau (Department of Commerce) which issues a monthly export report that indicates not only grain exports, but also product exports including soybean meal and oil, and wheat flour.[34] At the end of each commodity's marketing year, the Census Bureau export data become the official USDA export estimate.

The Census Bureau data are released with a nearly two-month lag; for example, export data for the month of January is not released until mid-March. As a result, both the *Export Sales* and the *Grains Inspected for Export* reports are closely watched for clues about the likelihood of meeting current USDA export forecasts—shortfalls or excesses reflect unexpected changes in commodity supplies and their related price forecasts. Many market information services routinely publish their own forecasts of weekly grain sales and inspections ahead of the release of the official reports. Market prices have been known to react to significant differences between the average of expected weekly exports by private forecasters and the actual weekly export announced in the official USDA reports.

In addition to monitoring U.S. agricultural trade, FAS routinely monitors and reports on international commodity market conditions through an international network of agricultural attaches. Although their data are not considered official, FAS attache reports—which provide detailed country- and commodity-specific market information for major foreign countries—are regularly published and made available to the public.[35] In addition, FAS's Production Estimates and Crop Assessment Division (PECAD) provides regular reports on foreign and world crop area, yield, and production estimates.[36] Various commodity divisions within FAS also produce monthly circulars on international market conditions for grains, oilseeds, cotton, and other commodities.[37]

U.S. Government Program Activity

In addition to crop production and marketing demand information, government program activity can have a significant influence on market prices. Several USDA

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[33] The weekly grain and oilseed inspection report is available at [http://www.ams.usda.gov/lsmnpubs/grainn.htm].

[34] For more information see U.S. Census Bureau, Foreign Trade Statistics,"available at [http://www.census.gov/foreign-trade/www/].

[35] FAS attache reports are available at [http://www.fas.usda.gov/scriptsw/attacherep/default.asp].

[36] PECAD reports on international crop area, yield, and production estimates are available at [http://www.pecad.fas.usda.gov/].

[37] A listing of FAS commodity divisions and their monthly circulars are available at [http://www.fas.usda.gov/commodities.asp].

agencies monitor and report on market-relevant government program activity. USDA's Farm Service Agency (FSA) provides information on government price and income supports, government stock-holding activity, and participation in the Conservation Reserve Program.[38] The Risk Management Agency (RMA) of USDA oversees and reports on the implementation of government-subsidized crop insurance.[39]

The various crop-specific subsidies and price and income supports provided under these government programs play an important role in producer planting decisions by altering the relative profitability of different crops in different regions. The Conservation Reserve Program also has an important effect on agricultural production because it removes large tracts of cultivable land from production for extended periods of time.[40] USDA's FAS monitors and reports on U.S. food aid programs, as well as on government programs that promote or assist U.S. agricultural exports.[41] Government-assisted exports draw from U.S. agricultural supplies and tend to support market prices. An unexpectedly large shift in program exports can alter market expectations and prices.

Market Price Information

USDA projects the season-average farm price (SAFP) for all major program crops contained in the *WASDE* report except for cotton.[42] The SAFP projection is usually presented as a range of high and low values that is tightened with each succeeding month until a single point estimate is reported near the end of each commodity's marketing year. Market observers and the various private market information services tend to use the mid-point of the USDA projected SAFP range as a reference point from which all comparisons are made (such as "too high" or "too low").

In support of the SAFP estimates reported in the *WASDE* report, NASS releases a monthly *Agricultural Prices* report that contains monthly and marketing year average prices received (weighted by the monthly share of annual marketings) for most major crops at both the national and state level for major producing states.

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[38] FSA commodity program outlay data are available at [http://www.fsa.usda.gov/dam/bud/bud1.htm]. FSA data on commodity price support activity is available at [http://www.fsa.usda.gov/dafp/psd/reports.htm].

[39] RMA's "National Summary of Business" reports for crop insurance are available at [http://www.rma.usda.gov/data/sob.html].

[40] For more information, see the CRS Report RS21613, *Conservation Reserve Program: Status and Current Issues*, by Barbara Johnson.

[41] FAS information on U.S. food aid is available at [http://www.fas.usda.gov/food-aid.asp]. Information on U.S. agricultural export credit program and other export assistance programs is posted at [http://www.fas.usda.gov/export.html].

[42] USDA is prohibited by law from publishing cotton price projections [12 U.S.C. 1141(j)(d)].

USDA's Agricultural Marketing Service (AMS) provides a portal to price and market information for a range of agricultural commodities.[43] The Livestock and Grain Market News Branch of AMS monitors and reports on: cash, barge, rail, and truck bids for grains and oilseeds at major terminal and export markets, including barge loading positions on the Mississippi, Ohio, and Illinois Rivers and at Central Illinois (Decatur) corn and soybean processing location; nearby futures contract prices and cash-to-futures basis; and recent export sales by grain type with details on tonnage and delivery dates in the *Daily Grain Review*, *Export Grain Bids*, *Daily National Grain Market Summary* and *Weekly National Grain Market Summary* reports.[44]

Ending Stocks as a Summary of Market Conditions

USDA projects season-ending stocks for all major program crops contained in the monthly *WASDE* report. Ending stocks are calculated as the difference between total supplies (beginning stocks plus production plus imports) and total disappearance (all domestic uses plus exports). As such, season-ending stocks of an annually produced commodity summarize the effects of both supply and demand factors during the marketing year.

In the early months of the marketing year, when most components of the supply and demand balance sheet are being forecast rather than estimated, expected ending stocks—expressed as a ratio over expected total use—are frequently used as an indicator of a commodity's expected price outcome by USDA and other market observers.[45] For most seasonal commodities, annual prices tend to have a strong negative correlation with their ending stocks-to-use ratio. (See **Figure 2** for an example.) As a result, expectations for high stocks relative to use typically result in lower prices, while expectations for low stocks relative to use tend to raise prices.

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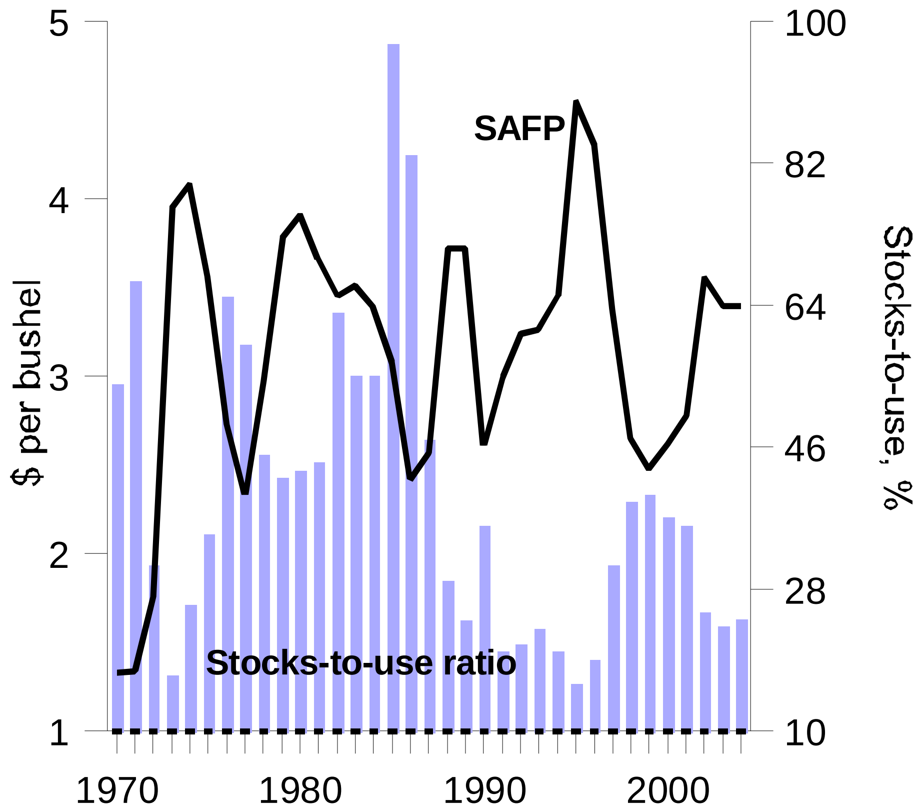
[43] AMS's market news website is located at [http://www.ams.usda.gov/marketnews.htm].

[44] For these and other market reports visit [http://www.ams.usda.gov/lsmnpubs/grainn.htm].

[45] For empirical evidence, see USDA, ERS, *Price Determination for Corn and Wheat*, TB-1878, Paul Westcott and Linwood Hoffman, July 1999; USDA, ERS, "Factors Affecting the U.S. Farm Price of Upland Cotton," Leslie Meyer, *Cotton and Wool Situation and Outlook*, CWS-1998, November 1998; and USDA, ERS, *How Does Structural Change in the Global Soybean Market Affect the U.S. Price?*, OCS 04D-01, Gerald Plato and William Chambers, April 2004; and Barry Goodwin, Randy Schnepf and Erik Dohlman, "Modelling soybean prices in a changing policy environment," *Applied Economics*, 2005, 37, pp. 253-263.

Figure 3. Season-Average Farm Price Received for All Wheat vs. End-of-Year Stocks-to-Use Ratio



Source: USDA, ERS, *Wheat Situation and OutlookYearbook 2004*, WHS-2004, March 2004; and *WASDE*, Dec 9, 2005.

A certain amount of stocks at the end of the marketing year are necessary to provide a continuous flow of grain to processors and exporters before the new crop is harvested. These stocks are referred to as pipeline supplies. Although there is no hard and fast rule on what volume of stocks represents pipeline levels for the major grain and oilseed crops, whenever stocks approach historically low levels market analysts speculate about what pipeline-stock levels might be. For wheat, pipeline stocks are thought to be in a range of 350 to 400 million bushels; for corn, 400 to 500 million bushels; and for soybeans, about 150 to 200 million bushels. Whenever USDA ending stock projections approach these levels, market prices become very sensitive to unexpected market news and prices tend to be more volatile than during periods of abundant stocks.

Overview of Commodity Markets

Macroeconomic Linkages to Commodity Markets

Long-run commodity demand is driven, in large part, by population and income dynamics. A country's demographic make-up by age and ethnicity may play a large role in determining food needs and preferences. However, demographic changes generally occur slowly and in accordance with well-know behavioral patterns. Similarly, per-capita income growth usually trends upward or downward gradually and predictably with the national economy. As a result, short-term price movements are rarely driven by either of these phenomena. However, an important exception is the 1997 Asian financial crisis which dramatically and quite suddenly curtailed commodity import demand in several major agricultural importing countries of East and Southeast Asia.[46] The 1997 Asian crisis contributed significantly to the price declines in most international commodity markets of the late 1990s.

Changes in currency exchange rates between trading nations can occur more suddenly and can have significant effects on international trade and prices. For an exporting country, a devaluation of its currency against other exporting countries has the same effect as a lowering of its export price against those competitor nations, thereby making its product more competitive. In contrast, for an importing country, a devaluation of its currency against the currency of exporting nations will make products from those exporters more expensive, thereby lowering its import demand. Currency appreciation will have the opposite effect. Currency exchange rate fluctuations and their economic implications are not unique to agricultural commodities, but affect all goods and services traded between nations.[47]

Special Considerations for Agricultural Markets

In general, agricultural commodity prices respond rapidly to actual and anticipated changes in supply and demand conditions. However, certain characteristics of agricultural product markets set them apart from most non-agricultural products and tend to make agricultural product prices more volatile than are the prices of most nonfarm goods and services.[48] Three such noteworthy characteristics of agricultural crops include the seasonality of production, the derived nature of their demand, and generally price-inelastic demand and supply functions.

Seasonality. Most agricultural crops grown in temperate-zone countries like the United States where freezing winters limit crop production to a 6- to 9-month period (the growing period is shorter at higher latitudes) have strong seasonal production patterns. As a result, the biological nature of crop production plays an important role in agricultural product price behavior.

In particular, the production of spring-planted crops has a lag in its response to market signals. Producers must make their planting decisions by early spring in order to purchase the seed and other inputs needed for production. However, producers do

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[46] For more information, see *International Financial Crises and Agriculture*, International Agriculture and Trade Reports, WRS-99-3, USDA, ERS, March 2000.

[47] For more information on currency exchange rates and their potential market effects see CRS Report RL31204, *Fixed Exchange Rates, Floating Exchange Rates, and Currency Boards: What Have We Learned?*, by Marc Labonte.

[48] William G. Tomek and Kenneth L. Robinson, *Agricultural Product Prices*, 4th Ed., Cornell University Press; 2003©Cornell University, p. 2.

not receive a price for their production until after the harvest when ownership of the physical commodity is transferred.[49] As a result, growers' planting decisions are based partly on their expectations about future yields, prices (of both outputs and the inputs needed to produce those outputs), and government program support rates for alternative production activities. Also, expectations concerning international market conditions and the possibility for unexpected changes in the trade outlook are often relevant for most major U.S. field crops.

A region's agronomic conditions, such as weather and soil types, may influence the viability of producing a particular crop or undertaking a livestock activity; however, expectations of market conditions such as harvest-time output prices influence the final choices. As a result, changes in the expected supply and demand of crops or other activities that compete for land, or of other food sources that compete for demand can ripple through the various agricultural markets, thus altering prices. Furthermore, since the end result of a planting-time production decision does not materialize until several months later at harvest time, it is possible that market conditions will have changed substantially or that a producer's actual production may be very different from the planned production due to unexpected variations in weather, pests, diseases, or other circumstances.

Derived Nature of Many Agricultural Product Prices. Demand for agricultural products originates with consumers who use the various food and industrial products that are produced from "raw" or unprocessed farm commodities such as grains, oilseeds, and fiber. At the consumer level, such final demand is referred to as primary demand. The term "derived demand" refers to demand for inputs that are used to produce the final products.[50] For example, corn and other feedstuffs are important inputs in the livestock industry; wheat is used to make various bakery products; and cotton is used in the production of textiles. Thus, the demand for corn, wheat, and cotton is derived from the demand for their various end products. Similarly, the demand for soybeans is derived from the demand for soybean meal and soybean oil—the major products obtained from crushing soybeans.

A diner at a restaurant may be seeking a particular flavor or texture in her steak which resonates back through the supply chain to the feeding decisions made at the ranch or feedlot where cattle are fattened and readied for market. As a result, the potential buyers of raw agricultural commodities are generally seeking a particular end-use characteristic. For example, a livestock feeder is generally trying to obtain the least-cost set of feed ingredients that yield a particular balance of protein, energy, fiber, and other nutrient components. A baker or miller might be looking for particular baking or milling qualities in their wheat purchases.

It is possible for the overall supply of a generic commodity to be in abundant supply, while a specific variety of that commodity possessing the desired end-use traits may be in short supply. As a result, substantial price premiums and discounts

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[49] Forward contracting can be used to lock in a price prior to harvest, but the money transfer from the buyer generally occurs after the harvest when the physical goods are delivered.

[50] Tomek and Robinson, *Agricultural Product Prices*, 4th Ed., Cornell University Press; 2003©Cornell University, pp. 25-28.

may develop based on the commodities' end-use characteristics. This occurs frequently in the wheat market where the different wheat varieties have very unique baking and milling characteristics. But it is also not uncommon in other grain and oilseed markets, e.g., rice (based on grain length), corn (based on color, and oil or starch content), soybean (based on protein or oil content), barley (based on malting quality), etc.

Price-Inelastic Demand and Supply. In general, the demand and supply of farm products, particularly basic grains and oilseeds, are relatively price-inelastic (i.e., quantities demanded and supplied change proportionally less than prices). This implies that even small changes in supply can result in large price movements. As a result, unexpected market news can produce potentially large swings in farm prices and incomes. This price dynamic has long been a characteristic of the agricultural sector and a farm policy concern.

The supply elasticity of an agricultural commodity reflects the speed with which new supplies become available (or supplies available in the marketplace decline) in response to a price rise (fall) in a particular market. Since most grains are limited to a single annual harvest, new supply flows to market in response to a post-harvest price change must come from either domestic stocks or international sources. As a result, short-term supply response to a price rise can be very limited during periods of low stock holdings, but in the longer run expanded acreage and more intensive cultivation practices can work to increase supplies.

On the other hand, when prices fall producers might be inclined to withhold their commodity from the market. The cost of storage, the length of time before any expected price rebound, the anticipated strength of a price rebound, and a producer's current cash-flow situation combine to determine if storage is a viable alternative. If a return to higher prices is not expected in the near future, storage may not be viable and continued marketings may add to downward price pressure.

Similarly, demand elasticity reflects a consumer's ability and/or willingness to alter consumption when prices for the desired commodity rises or falls. Consumers consider both own-price and cross-price movements of complementary and substitute products in making their expenditure decisions. Willingness to substitute another commodity when prices rise depends on several factors, including the number and availability of substitutes, the importance of the commodity as measured by its share of consumers' budgetary expenditures, and the strength of consumers' tastes and preferences. Since the farm cost of basic grains generally amounts to a very small share of the retail cost of consumer food products, changes in grain prices generally have little impact on retail food prices and therefore little impact on consumer behavior and corresponding farm-level demand. For example, grain is estimated to account for only a 5% share of the retail price of a one-pound loaf of bread.[51] A 20% rise in wheat prices would translate into only about a 1% rise in the price of a loaf of

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[51] For this and other farm to retail commodity price comparisons, see the USDA, ERS briefing room *Food Marketing and Price Spreads*, Farm-to-Retail Price Spreads at [http://www.ers.usda.gov/Briefing/FoodPriceSpreads/spreads/table1a.htm].

bread. Few consumers would notice a 2-cent increase in the price of a $2 loaf of bread.

Figure 4. Price Changes Due to a Supply Shift Are Larger than Quantity Changes under Inelastic Demand Curves

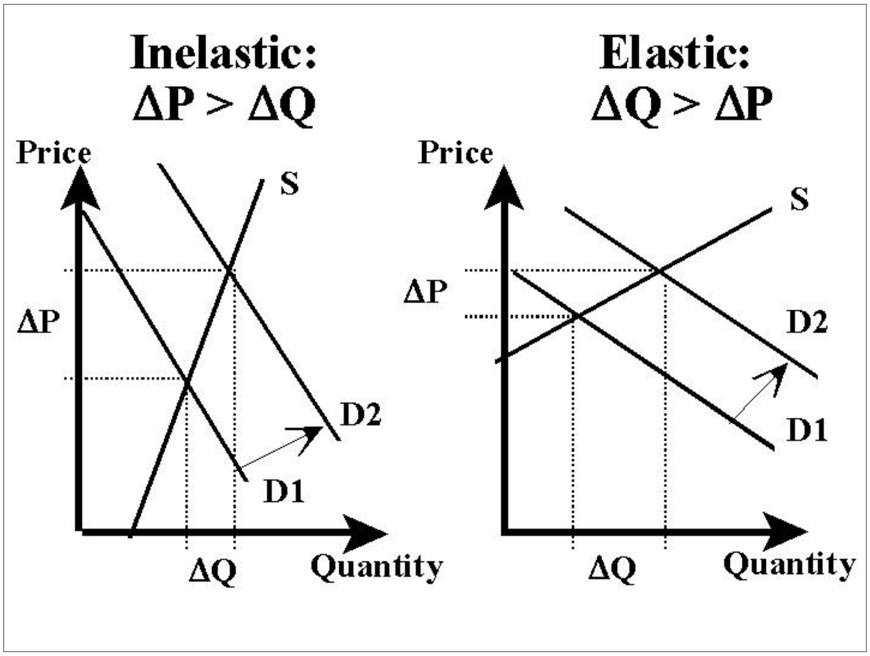

Figure 4 displays examples of both inelastic and elastic supply and demand curves. The diagram on the left-hand side of **Figure 4** shows fairly price-unresponsive (i.e., inelastic) demand and supply curves—typical of those associated with most seasonal agricultural markets. A sudden outward shift (i.e., expansion) in demand from D_1 to D_2 moves the market equilibrium outward along the supply curve S. This change in market equilibrium results in only a modest percentage change in the quantity supplied to the market, $\Delta Q/Q$, compared with a much larger percentage increase in prices, $\Delta P/P$. A similar large price change is obtained from a sudden shortfall in supplies represented by a leftward movement of the supply curve. In contrast, greater than expected supply (represented by a rightward shift of the supply curve S) would lead to a large drop in the market price (ignoring the effects of government programs).

The diagram on the right-hand side of **Figure 4** displays more responsive (i.e., more elastic) demand and supply curves—typical of those associated with many higher-valued, non-agricultural markets. For comparative purposes, assume the same sudden outward shift in demand from D_1 to D_2 moves the market equilibrium outward along the supply curve S. Here, however, the change in market equilibrium results in a much larger percentage change in the quantity supplied to the market, $\Delta Q/Q$, compared with a smaller percentage increase in prices, $\Delta P/P$.

Increasing demand for grains and oilseeds by the industrial processing sector, whether from food or biofuels processing industries or from expanding industrial hog and poultry operations, further reinforces the general price inelasticity of demand for many agricultural commodities. Industrial use of grains is generally less sensitive to price change since, as with retail food prices, the price of the agricultural commodity usually represents only a small share of overall production costs of the finished product. Furthermore, industrial users have generally made tremendous investments in plant equipment and machinery, and must continue to operate at some minimal level of capacity year-round as a return on that investment.

In contrast, feed demand for grain and protein meals, particularly for cattle feeding in the Southern and Central Plains States, is far more sensitive to relative feed grain prices, since similar feed energy values may be obtained from a variety of grains. Cattle feeders in these regions have considerable leeway to vary the shares of different grains in their feed rations as relative prices change.

In general, inelastic demand and supply responsiveness characterizes most agricultural products. However, distinct differences in the level and pattern of responsiveness do exist across commodities. Some of these differences are briefly introduced below.

Wheat

Background. Wheat is grown in almost every temperate-zone country of North America, Europe, Asia, and South America. The largest wheat producing countries are China, India, the United States, Russia, Canada, and Australia. U.S. wheat production accounts for about 9-10% of world production; but the United States is the world's leading wheat exporter with roughly a 25% share of annual world trade. However, the international wheat market is very competitive and foreign sales often hinge on wheat variety and product characteristics as well as price.

The U.S. marketing year for wheat runs from June 1 to May 31.[52] U.S. wheat is produced as both a winter and a spring crop. Winter wheat is usually seeded in September or October of the preceding year. The United States produces all six of the world's major wheat classes—hard red winter (HRW), hard red spring (HRS), soft red winter (SRW), hard white, soft white, and durum. Hard wheats generally contain higher protein levels—a desirable trait for bread making, while softer wheats may be preferable for making noodles, crackers, and pastries. Durum wheat is ground into a coarse flour called semolina that is used for making pastas. In local markets, the demand for a particular wheat class (and quality) relative to its nearby supply will determine local prices. However, linkages to national and global markets bring a variety of additional factors—such as transportation costs, competitors supplies, and foreign demand—into play in determining the price of a particular wheat type and quality.

Wheat is the principal food grain grown in the United States; however, a substantial portion (8%-10%) of the annual U.S. wheat crop is used as a feed grain. As a result, wheat must compete with other cereals for a place at the consumer's dinner table, while also vying with coarse grains and other feedstuffs in livestock

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[52] For more information on wheat markets, see USDA, ERS, *Wheat Briefing Room*, available at [http://www.ers.usda.gov/Briefing/Wheat/].

feed markets. Almost half of the U.S. wheat crop is exported annually, although the importance of exports varies by class of wheat. White wheat and HRS wheat rely more than other wheat classes on sales into export markets. The larger the share of exports to production, the greater the vulnerability to international market forces.

In the U.S. domestic market, flour millers are the major users of wheat, accounting for over 70% of primary domestic wheat processing in 2000 and 2001.[53] In most cases, a wheat buyer at a flour mill will "source" wheat by general location and primary quality attributes such as protein quantity and quality (i.e., gluten share), and baking performance. Price premiums and/or discounts reflecting quality differences often develop and can also influence buyer preferences. Other major wheat processors include breakfast food, pet food, and feed manufacturers. Wheat may be used directly in feed rations when alternate feedstuffs are lacking or when production-related quality damage makes the wheat unmarketable as a food. Wheat milling by-products such as bran, shorts, and middlings are also used by feed manufacturers in the production of animal feeds.[54]

Key Market Factors. Several factors that are somewhat unique to the wheat market suggest that the U.S. wheat market structure has greater supply and demand elasticity than most other field crops. In other words, wheat supply and demand appear to respond faster than the supply and demand of other grains when confronted with some external shocks such as a crop failure in a competing exporter country or a financial crisis in a major purchasing country. Thus, wheat prices are generally subject to less dramatic price swings than most other grains.[55]

These characteristics include the confluence of food and feed markets; seasonal differences between U.S. winter and spring production; seasonal differences between northern and southern hemisphere crops; a large number of foreign export competitors, and U.S. government food aid programs which rely heavily on wheat.

First, the feed potential of wheat can dampen wheat price variability, either preventing prices from falling too low by introducing an additional source of demand or by shutting off that same demand source when prices rise too high relative to other feed grains. For example, if wheat prices fall too low, wheat begins to compete with traditional feed grains (e.g., barley, sorghum, oats, and corn), particularly in the Southern and Northern Plains States where local feed grain production is frequently insufficient. On the other hand, as wheat prices rise above a certain threshold in relation to feed grains, livestock feeders are quick to reduce the share of wheat in their feed rations thus removing demand pressure underlying the wheat price rise.

Second, U.S. wheat production is marked by two independent seasons, winter and spring, with planting periods nearly six months apart. If it is apparent that winter

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[53] Calculated from Appendix Table 23, *Wheat Situation and Outlook Yearbook*, WHS-2003, USDA, ERS, March 2003.

[54] For definitions, see the CRS glossary *Agriculture: A Glossary of Terms, Programs, and Laws*, web version, available at [http://www.congress.gov/erp/lists/agglossary.html].

[55] USDA, ERS, *Agricultural Outlook*, "Assessing Agricultural Commodity Price Variability," by Randy Schnepf, October 1999, pp. 16-21.

wheat acreage is substantially below market expectations due to prevented plantings or that expected yields have suffered due to unusual winter weather during the October-March period, some of the potential production losses can be offset by increased spring wheat plantings. Given the correct price signals relative to other crops, spring wheat can crowd out other spring-planted crops that compete for the same acreage (e.g., barley, sorghum, sunflowers, soybeans, or corn). Or fallow acreage—rotated out of production to rebuild soil moisture—can be prematurely brought back into production in the spring provided prices are attractive.

Third, two of the U.S.'s major wheat export competitors—Australia and Argentina—are in the southern hemisphere where their production runs on a cycle that is offset by about six months from the U.S. cycle. As a result, Argentina and Australia have the opportunity to expand planted wheat acreage in response to supply and demand circumstances in the United States within the same marketing year, dampening the potential year-to-year variability of prices in the U.S. and international market. While this potential additional supply limits price rises, it may deepen price declines because high storage costs and limited storage capacity in those countries frequently push their surplus production into international markets even when prices are low.

Fourth, the potential for surplus production to enter agricultural markets from several competing wheat exporter nations (principally Canada, Argentina, Australia, the EU, and the Black Sea region) increases the supply responsiveness of wheat beyond that of other major grains. For example, U.S. corn generally faces direct export competition from only two countries, Argentina and China.

Fifth, most government export programs have been directed at wheat and have dampened price variability in much the same manner as feed demand—they introduce an additional source of demand that offsets price declines. Because export programs are funded to deliver a *fixed value* of commodities, the *volume* of U.S. program grain exports rises during periods of excess supply and lower prices, but falls when supplies are tighter and prices higher.

In summary, the price sensitivity of wheat feeding and government export programs, coupled with the opportunity for U.S. spring wheat growers and southern hemisphere producers to respond to northern hemisphere winter wheat conditions, provides an important stabilizing effect on U.S. wheat market prices in the face of variable world demand.

Corn

Background. Like wheat, corn is grown in almost every temperate-zone country of North America, Europe, Asia, and South America. However, global corn production is less well distributed than wheat, and only a few countries tend to dominate production and trade in corn. Three countries—the United States, China, and Brazil—account for two-thirds of world production. The United States is the dominant corn exporter with a two-thirds share of world markets. China and Argentina account for another 20% share of world trade. The Ukraine, Brazil, and the Republic of South Africa are inconsistent exporters, but have shown an increasing trend since 2000. This small pool of potential exporters can make international corn prices vulnerable to a weather disruption in one of the major exporter countries.

The U.S. marketing year for corn runs from September 1 to August 31.[56] Corn is the most widely produced feed grain in the United States, accounting for more than 90% of total value and production of feed grains. Other U.S. feed grains include grain sorghum, barley, and oats. Around 80 million acres of land are planted every year to corn, making it the single largest crop grown in United States. A majority of the U.S. corn crop is grown in the traditional Corn Belt region encompassing a swath of states running from Ohio westward through Indiana, Illinois, Iowa, southern Minnesota, northern Missouri and into the eastern Dakotas and Nebraska.

Since 2000, about 58% (on average) of the U.S. corn crop has been fed to livestock as a primary energy source. Another 24% has been processed into a multitude of food and industrial products including starch, sweeteners, corn oil, beverage and industrial alcohol, and fuel ethanol. Finally, about 18% of U.S. corn production has been exported into international markets.

Key Market Factors. As a feed grain, corn must compete with a broad range of feedstuffs including other coarse grains, as well as feed wheat and in some cases low-priced protein meals. This makes feed grain markets particularly sensitive to relative prices among the various feed components. In the United States, the other two major feed grains—feed barley and grain sorghum—have roughly 95% of the feed value of corn.[57] As a result, they are often priced against corn futures on the basis of their relative feed value.

Because most U.S. corn exports are destined to be used for livestock feed, U.S. corn exports are particularly vulnerable to the availability of alternate feed sources. For example, an early harvest freeze in late August in the Canadian prairies has been known to convert a significant portion of Canada's high-value, high-protein wheat crop into low-priced feed grain in a single night. As such, Canadian feed wheat traditionally has been very competitive in East Asian markets, particularly South Korea, at the expense of U.S. corn exports. However, the extent to which corn is crowded out of certain feed markets depends on the feeding operation involved. Some livestock species, e.g., feeder cattle or dairy, are better able to adjust to feed rations than others, e.g., swine or poultry which are more corn-dependent.

A factor of growing importance in U.S. corn markets is the increasing use of corn for ethanol production. This growth has been supported by several national and state programs.[58] An increase in the share of total demand attributed to industrial use could lead to greater price variability in the face of weather-driven supply shortfalls.

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[56] For more information on corn and other feed grain markets, see USDA, ERS, *Corn Briefing Room* available at [http://www.ers.usda.gov/Briefing/Corn/].

[57] USDA, ERS, *Animal Feeds Compendium*, Agricultural Economic Report No. 656, by Mark Ash, May 1992.

[58] For more information on national and state programs that support corn-based ethanol production, see CRS Report RL32712 *Agriculture-Based Renewable Energy Production*, by Randy Schnepf.

In the 2005-2006 marketing year, USDA projects that 15% of U.S. corn production (or about 1,575 million bushels) will be used for ethanol production. This compares with a 4% share in 1990/1991 and a 6% share in 2000/01. Continued growth in corn-based ethanol production without concomitant growth in corn production will tend to support prices and possibly squeeze U.S. corn out of price-sensitive feed and export markets.[59]

Rice

Background. Rice is the most important food staple for much of the world's population, particularly in Asia and parts of Africa and the Middle East. Rice is produced and consumed throughout the world in climates that range from temperate to tropical. However, Asian rice production accounts for nearly 90% of global rice production with two countries—China and India—accounting for over half.

U.S. rice production generally accounts for a very small share (less than 2%) of world production. However, the United States exports nearly half of its annual production. As a result, the United States is among the world's leading rice exporting nations, traditionally behind Thailand and Vietnam. India, Pakistan, China, and Egypt are also important rice exporting nations.

In the United States, the marketing year for rice runs from August 1 to July 31.[60] Domestic production generally uses slightly more than half of the U.S. crop every year. U.S. rice use falls into three major categories: table rice used directly as food; rice processed into other types of consumables such as snacks or ready-to-eat meals; and rice used in the brewing industry.

Key Market Factors. Only a small share, estimated at about 6%, of global rice production enters world markets. As a result, the very limited amount of rice entering world markets (24-28 million metric tons annually) relative to the large level of annual world consumption (roughly 415 million metric tons) makes the international rice market fairly sensitive to an unexpected production shortfall in one of the major exporting or consuming countries, particularly if the lost production must be made up by importing rice from the international marketplace.

In world markets there are two principal types of rice—long grain (indica) and short grain (japonica)—each with very specific cooking qualities and appearance. Consumers tend to have strict preferences for one or the other and rarely switch. As a result, it is not uncommon for overall world rice supplies to be in surplus while supplies of one or the other type of rice may be in short supply relative to market demand. The United States produces and exports both indica and japonica types of rice.

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[59] Robert N. Wisner and C. Phillip Baumel, "Ethanol, Exports and Livestock: Will There Be Enough Corn to Supply Future Needs?" *Feedstuffs*, Issue 30, vol. 76, July 26, 2004.

[60] For more information on U.S. and international rice markets, see USDA, ERS, *Rice Briefing Room* available at [http://www.ers.usda.gov/Briefing/Rice/].

Rice processing further differentiates rice products and markets. Rice quality is often associated with the degree of polishing (removing the hull and bran layers) or whiteness of the grain and the percentage of whole versus broken grains. Both of these attributes are highly dependent on milling infrastructure—a market feature that the U.S. rice industry has used to its advantage to compete in international markets. Parboiling rice (a process of steeping, then precooking rough rice under pressure with its bran hull rice, then removing the hull through abrasion) results in a product that is preferred by certain markets (e.g., Saudi Arabia, the Republic of South Africa, and Nigeria).

Cotton

Background. Cotton is the single most important textile fiber in the world, accounting for over 40% of total world fiber production.[61] While some 80 countries from around the globe produce cotton, the United States, China, and India together provide over half the world's cotton. About one-third of annual world production is traded in international markets. The United States, while ranking second to China in production, is the leading exporter, accounting for over one-third of global trade in raw cotton.

The U.S. marketing year for cotton runs from August 1 to July 31. The U.S. textile industry has been in decline for the past decade. As a result, domestic use of cotton has represented a declining share of annual production and the U.S. cotton sector has increasingly turned to international markets to sell its output. Since 2002/03, slightly more than 60% of the U.S. crop has been exported.

Key Market Factors. Cotton competes with several other fibers in U.S. and international textile markets. Cotton's principal competitor is polyester, but rayon, wool, jute, flax, and silk are also used in the production of yarn for fabric. As a result, local and international market conditions for these substitutes play a role in U.S. and international cotton price formation.

The phaseout of the Multifiber Arrangement (MFA) and other forces have been reshaping world textile and cotton markets in recent years.[62] The MFA and its predecessor agreements—through their set of trade rules and import quotas—directly influenced world textile and clothing trade patterns (and indirectly influenced world cotton markets) for nearly 50 years. These agreements protected U.S. and European Union (EU) textile and clothing producers from imports, but raised prices and reduced consumption in both U.S. and EU markets.

The elimination of the MFA (concluded on December 31, 2004) is helping reduce clothing prices in the United States and the EU and causing a shift in

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[61] For more information on cotton and other fiber markets, see USDA, ERS, *Cotton Briefing Room* available at [http://www.ers.usda.gov/Briefing/Cotton/].

[62] For more information on the MFA and its potential effects, see USDA, ERS, *The Forces Shaping World Cotton Consumption After the Multifiber Arrangement*, Cotton Outlook Report No. (CWS-05C-01), 30 pp, April 2005, available at [http://www.ers.usda.gov/Publications/cws/apr05/cws05c01/].

industrial demand for cotton to China, India, and Pakistan. At the same time, world cotton consumption has accelerated along with economic growth since 1999, especially in developing Asia, where an emerging consumer society is driving increases in household consumption of clothing and other cotton products. In the long run, income growth and technical change are expected to have a greater effect on world cotton consumption than the elimination of the MFA.

Government programs such as Step-2 payments for domestic users and exports, have also played an important role in facilitating both domestic consumption and exports of U.S. cotton.[63] However, following a widely publicized ruling in 2004 (upheld on appeal in 2005) against certain features of the U.S. cotton program in a dispute settlement case brought by Brazil at the World Trade Organization (WTO), U.S. government cotton programs are likely to be altered with important potential market consequences.[64] The Administration has already announced changes to the U.S. export credit guarantee program designed to accommodate the WTO ruling, and the U.S. Congress has proposed eliminating the Step-2 user payments in legislation that has passed both chambers (H.R. 4241, S. 1932). Conference action is pending. The effects of altering U.S. export credit guarantees and the elimination of Step-2 user payments (if enacted) are likely to reduce U.S. cotton exports and, by softening demand, put downward pressure on domestic market prices.

In addition to the WTO case, intense international pressure has been brought to bear upon cotton subsidies in general and U.S. cotton subsidies in particular at the on-going Doha Round of WTO trade negotiations. It remains to be seen if these pressures will elicit further changes to the U.S. cotton program. The market effect of further reductions in U.S. cotton program support would depend on the specific nature of the changes and how they would be implemented.

The Oilseed Complex

Background. The demand for oilseeds is derived primarily from the demand for edible oils and protein meals. The international oilseed market consists of a large variety of oil-bearing crops produced throughout the world including temperate-zone crops such as canola, rapeseed, and sunflowerseed; tropical-zone crops such as palm kernel and coconut copra; and multi-zone crops such as soybeans, cottonseed, and peanuts. Most of these crops, when crushed for their oil, also yield high-protein meals that are widely used in livestock and poultry rations. As a result, most of them are relatively close substitutes and their prices are strongly correlated.

Processed soybeans are the largest source of protein feed and vegetable oil in the world. Unlike many other commodity markets, only a few countries tend to dominate soybean production and trade, making the market sensitive to any supply disruption in one of the major producing nations. Major soybean producers include the United States, Brazil, China, and Argentina which combined have accounted for

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[63] For a description of the U.S. cotton programs, see CRS Report RL32442, *Cotton Production and Support in the United States*, by Jasper Womach.

[64] For more information, see CRS Report RS22187, *U.S. Agricultural Policy Response to WTO Cotton Decision*, by Randy Schnepf.

nearly 90% of global production since 2000. Three countries—United States, Brazil, and Argentina—dominate world soybean trade, accounting for about 92% of soybean exports since 2000; while two countries, the EU and China, have accounted for nearly two-thirds of world imports.

The U.S. marketing year begins on September 1 for soybeans and on October 1 for soybean meal and soybean oil.[65] Soybeans equal about 90% of U.S. total oilseed production, while other oilseeds—such as cottonseed, sunflowerseed, rapeseed, canola, and peanuts—account for the remainder. The United States is the world's leading soybean producer and exporter. Soybean and soybean product exports accounted for 43% of U.S. soybean production in 2003. In the United States, soybean oil accounts for about two-thirds of all the vegetable oils and animal fats consumed. Similarly, soybean meal is the dominant protein meal consumed in the United States. U.S. vegetable oil exports are heavily influenced by concessional food aid to developing nations through such programs as P.L. 480.[66]

Soybean meal is the world's most important protein feed, accounting for nearly 65% of world supplies. Livestock feeds account for 98% of soybean meal consumption. Similarly, soybean oil is the world's largest source of vegetable oil. An important market development of the past decade has been the phenomenal growth of soybean output and exports by Brazil and Argentina. Together they currently account for about half of the world soybean export market, up from less than 15% before 1980; they have each surpassed the United States in soybean meal and soybean oil exports. Vast untapped reserves of farmland in Brazil's interior region could permit a continued significant expansion in soybean area, production, and exports.

The tropically-produced palm oil accounts for an important and growing share of global vegetable oil production (USDA projects a 30% share in 2005) and vegetable oil trade (a projected 58% share in 2005). Malaysia and Indonesia are the world's leading palm oil producers and exporters. Indonesia still possesses substantial untapped territory for further expansion of palm oil plantations. The rapid growth in Southeast Asian palm-oil output means it will likely surpass soybean oil's top ranking within a few years.

Key Market Factors. Because of their primary processed products—protein meal and vegetable oil—oilseeds are affected by market conditions in both the feed-grain and edible oil sectors of U.S. and international markets. Foreign import demand for whole oilseeds depends on the deficit between a countries' domestic oilseed output and its consumption. Divergent requirements for protein meal and vegetable oil, as well as limits on domestic processing capacity, determine the ratio of oilseeds to oilseed products that a country will import.

[65] For more information on soybeans and other oilseed markets, see USDA, ERS, *Soybean and Oil Crops Briefing Room* available at [http://www.ers.usda.gov/Briefing/SoybeansOilCrops/].

[66] See USDA's FAS for a description of U.S. food aid programs, available at [http://www.fas.usda.gov/food-aid.asp].

Some oilseeds have higher oil content than others; and some oilseeds yield a higher protein content meal with less fiber, making them more easily digestible. For example, a unit of soybean when crushed will yield, on the average, about 18%-19% oil and 74%-80% meal with about 44% protein content. Soybean meal is the most valuable component obtained from processing the soybean, ranging from 50%-75% of its value (depending on relative prices of soybean oil and meal). As a result, an importer must weight the relative prices for vegetable oils and protein meals against the oil and meal yields for each type of oilseed, as well as the protein and fiber content of the resultant meal. Another consideration is fiber content. High-fiber meals are better suited for ruminants (e.g., feeder cattle and dairy) than for non-ruminants (e.g., swine and poultry).

For soybean crushers, the processing decision involves choosing when to commit to buying soybeans (e.g., from farmers), to processing them, and to selling soybean meal and oil (e.g., to food and feed manufacturers). The main decision variable in making binding commitments on future dates to sellers and buyers is the gross soybean processing margin. This margin equals the per-bushel revenue of soybeans processed into oil and meal minus the per-bushel soybean price. If the gross soybean-processing margin is high enough, a processor will commit soybean-processing resources for that date. If it is too low, the processor keeps the processing resources available for a future date and a higher margin.

Compared with trade in other agricultural commodities, trade in whole oilseeds, particularly soybeans, is relatively unrestricted by tariffs and other border measures. But oilseed meals, and particularly vegetable oils, typically have higher tariffs. Successful completion of the on-going Doha Round of multilateral trade negotiations could reduce import tariffs and quantitative restrictions to global oilseed product markets offering increased growth in demand.

An important demand-side market development has been the rapid growth of China's and India's economies which has spurred their domestic food consumption. China is now the world's leading soybean importer, and both China and India are among the world's largest vegetable oil importers. The EU is self-sufficient in vegetable oil production, but its protein deficit still makes it the world's largest importer of soybean meal and second-largest importer of soybeans. Changes in agricultural and trade policies for all three of these countries have greatly influenced world oilseed markets.

Appendix Tables

Appendix Table 1. Major Agricultural Commodity Futures Exchanges

Futures Exchange	Abbreviation	Internet address
Minneapolis Grain Exchange	MGE	[http://www.mgex.com]
Chicago Board of Trade	CBOT	[http://www.cbot.com]
Kansas City Board of Trade	KCBOT	[http://www.kcbot.com]
New York Cotton Exchange	NYCE	[http://www.nyce.com]
Winnepeg Grain Exchange	WCE	[http://www.wce.ca]
Buenos Aires Cereals Exchange	BOLSA	[http://www.bolsadecereales.com]
Rosario Futures Exchange	ROFEX	[http://www.rofex.com.ar]
European Union Commodity Futures[a]	Euronext.liffe	[http://www.euronext.com]
South African Futures Exchange	SAFEX	[http://www.safex.co.za]

a. The Euronext is a synthesis of stock markets within the European Union including the previous London and Paris Commodity Futures Exchanges.

Appendix Table 2. Major Agricultural Commodity Futures Contracts, Futures Exchanges, and Contract Months

Commodity specification[b]	Ticker Symbol	Futures Exchange	Contract months[a]
Wheat, No. 2, Soft Red Winter	W	CBOT	N,U,Z,H,K
Rough Rice, No. 2	RR	CBOT	U,Z,H,K,N
Oats, No. 2 Heavy	O	CBOT	N,U,Z,H,K
Corn, No. 2 Yellow	C	CBOT	Z,H,K,N,U
Soybeans, No. 2 Yellow	S	CBOT	U,X,F,H,K,N,Q
Soybean Oil, crude	BO	CBOT	V,Z,F,H,K,N,Q,U
Soybean Meal, 48% protein	SM	CBOT	V,Z,F,H,K,N,Q,U
Wheat, No. 2 Northern Spring	MW	MGE[c]	H,K,N,U,Z
Hard Red Winter Wheat index[d]	HRWI	MGE	All months
Hard Red Spring Wheat Index[d]	HRSI	MGE	All months
Soft Red Winter Wheat index[d]	SRWI	MGE	All months
National Corn index[d]	NCI	MGE	All months
National Soybean index[d]	NSI	MGE	All months
Wheat, No. 2, Hard Red Winter	KW	KCBOT	N,U,Z,H,K
Cotton, No. 2, 1 1/16 inch	CT	NYCE	H,K,N,U,Z
Feed Wheat	WW	WCE	H,K,N,V,Z
Canola, No. 1 Canada	RS	WCE	F,H,K,N,U,Z
Barely, No. 1 Canada Western	AB	WCE	H,K,N,V,Z
Milling Wheat, European	na	Euronext	F,H,K,N,U,X
Feed Wheat, European	na	Euronext	F,H,K,N,U,X
Corn, French yellow	na	Euronext	F,H,M,Q,X
Rapeseed, any origin	na	Euronext	F,K,Q,X[e]
White Maize	WMAZ	SAFEX	H,K,N,U,Z
Yellow Maize	YMAZ	SAFEX	H,K,N,U,Z
Wheat	WEAT	SAFEX	H,K,N,U,Z
Sunflower	SUNS	SAFEX	H,K,N,U,Z

Source: Compiled by CRS from sources listed in **Appendix Table 1**.

na = not applicable.

a. Jan = F; Feb = G; Mar = H; Apr = J; May =K ; June = M; July = N; Aug. = Q; Sep. = U; Oct. = V; Nov. = X; and Dec. = Z.
b. Refer to the contract specification information available at each exchanges website provided in **Appendix Table 1**. In general, other grades are available for delivery at quality premiums and discounts.
c. The MGE introduced a durum futures contract in 1998. However, the durum contract was ended on March 20, 2003, due to low volume.
d. Cash settlement only, no physical delivery of the commodity is accepted.
e. For 2004, the April (J) and June (M) contract months are available.

Appendix Table 3. Annual Release Schedule for Key USDA Crop and Market Information Reports

Date[a]			
Mo.	**Yr.**	**Report title**	**Contents[b]**
Jan.	T	*Winter Wheat & Rye Seedings*	1st estimate of planted area for U.S. winter wheat and rye.
Jan.	T	*Grain Stocks*	Estimate of U.S. stocks by position (on- and off-farm) for all wheat, coarse grains, and oilseeds on January 1.
Jan.	T	*Rice Stocks*	Estimate of U.S. stocks by type (long, medium-short, and broken) for milled and rough rice on January 1.
Mar.	T	*Prospective Plantings*	Planting intentions for U.S. spring-planted crops.
Mar.	T	*Grain Stocks*	Estimate of U.S. stocks (on- and off-farm) for all wheat, coarse grains, and oilseeds on March 1.
Mar.	T	*Rice Stocks*	Estimate of U.S. stocks by type for milled and rough rice on March 1.
May	T	*Crop Production*	1st estimate of yield and harvested area for U.S. winter wheat.
May	T	*WASDE*	1st projection for marketing year (T/T+1) of: U.S. season-average farm prices (SAFP); U.S. and foreign total supply and use balance (S&U)[c] for rice, cotton, oilseeds, wheat, and coarse grains; and foreign country (S&U) for coarse grains and wheat.
June	T	*Grain Stocks*	Estimate of U.S. stocks (on- and off-farm) for all wheat, coarse grains, and oilseeds on June 1.
June	T	*WASDE*	All available S&Us are updated based on new market information.
June	T	*Acreage*	1st estimate of planted area for U.S. spring-planted crops.
July	T	*Crop Production*	1st estimate of yield for U.S. spring wheat, barley, oats, durum, and rye. 1st production estimate based on June *Acreage* estimate of harvested area for major crops.
July	T	*WASDE*	1st projection for foreign country (S&U) for rice, cotton, and oilseeds. All available S&Us are updated based on new crop and market information.
Aug.	T	*Rice Stocks*	Estimate of U.S. stocks by type for milled and rough rice on August 1.
Aug.	T	*Crop Production*	1st estimate of yield and harvested area for U.S. coarse grains, rice, cotton, oilseeds, sugar cane, and sugar beets.
Aug.	T	*WASDE*	All S&Us are updated based on new crop and market information.
Sept.	T	*Grain Stocks*	Estimate of U.S. stocks (on- and off-farm) for all wheat, coarse grains, and oilseeds on Sept. 1.

Date[a]			
Mo.	**Yr.**	**Report title**	**Contents[b]**
Sept.	T	*Crop Production*	New yield estimates and possible harvested area adjustments for U.S. coarse grains, rice, cotton, oilseeds, sugar cane, and sugar beets.
Sept.	T	*WASDE*	All S&Us are updated based on new crop and market information.
Oct.	T	*Rice Stocks*	Estimate of U.S. stocks by type for milled and rough rice on October 1.
Oct.	T	*Crop Production*	New yield estimates and possible harvested area adjustments for U.S. coarse grains, rice, cotton, oilseeds, sugar cane, and sugar beets.
Oct.	T	*WASDE*	All S&Us are updated based on new crop and market information.
Nov.	T	*Crop Production*	New yield estimates and possible harvested area adjustments for U.S. coarse grains, rice, cotton, oilseeds, sugar cane, and sugar beets.
Nov.	T	*WASDE*	All S&Us are updated based on new crop and market information.
Dec.	T	*Crop Production*	New yield estimates and possible harvested area adjustments for U.S. cotton.
Dec.	T	*WASDE*	All S&Us are updated based on new crop and market information.
Jan.	T+1	*Crop Production, WASDE*	Final planted and harvested area, yield, and production for U.S. crops.
Jan.	T+1	*Winter Wheat & Rye Seedings*	Final planted and harvested area for U.S. winter wheat.

Source: USDA, NASS for *Winter Wheat and Rye Seedings, Prospective Plantings, Acreage, Crop Production, Grain Stocks*, and *Rice Stocks* reports; USDA, WAOB for the *WASDE* report.

a. T represents the current calendar year; T-1 represents the previous calendar year; and T+1 represents the next calendar year. Season-average prices and supply-and-use balances are calculated for a crop's marketing year, i.e., the 12-month period starting from the first harvest month in the crop's primary growing region. Because most of the marketing year for most crops extends over parts of two different calendar years, they are represented by the expressions T/T+1. For example, the 2005-2006 marketing year is often referred to simply as the 2005 marketing or crop year. For the specific release date of a USDA report in 2006, see a calendar of 2006 release dates at [http://www.whitehouse.gov/omb/inforeg/pei_calendar2006.pdf].

b. In USDA reports the terms estimate, forecast, and projection have very distinct and different meanings. See section "Estimates, Forecasts, & Projections" for a description.

c. These preliminary U.S. S&U projections use: linear-trend yield forecasts; planting intentions area from the *Prospective Plantings* report; and the historical harvested-to-planted area relationship to derive harvested area for U.S. spring-planted crops. Winter wheat harvested area is available from the *Crop Production* report for May.

Appendix Table 4. Major NASS Crop Production Reports

Acreage
Winter Wheat and Rye Seedings report (January) contains the first forecast of winter wheat and rye planted area.

Prospective Plantings report (end of March) is a survey of farmer planting intentions all spring-planted field crops as of early March.

Acreage report (late June) is a survey of actual and intended farmer plantings of all field crops as of early June. This survey represents the first area forecast for crops.

Small Grains Summary (late September) contains the first estimate of winter and spring wheat harvested area for the just-finished marketing year.

Yields
Crop Progress reports are released weekly between April and November. Each report contains state- and national-level information on:

(1) **Crop progress** as of the report date in terms of plantings, various plant growth stages, and harvesting. Comparisons are made with the previous week, the previous year, and the five-year average.
(2) **Crop condition** rated as percent that is: very poor, poor, fair, good, and excellent.

The *Weekly Weather and Crop Bulletin* provides a weekly weather update for the principal crop producing regions. It includes weather map contours and indexes for crop moisture, extreme minimum and maximum temperatures, weekly precipitation, departure from average temperature, growing degree days, and a summer review of national weather, as well as the long-term Palmer drought severity index. In addition, the bulletin contains an international weather and crop summary for major foreign production regions.

Production
Crop Production reports are released monthly throughout the calendar year. Each report contains state-by-state area, yield, and production estimates for major field and specialty crops. The crop coverage varies in each report with a focus on those crops that are currently in an active seasonal growth pattern.

Prices
The *Agricultural Prices* report, released monthly throughout the calendar year, contains estimates of previous month's average farm price received for major field and specialty crops, as well as for livestock, poultry, meat, and produce. Each report also contains a preliminary farm price estimate for the current month. Monthly average prices are weighted by marketings. Each report also includes an all-farm products index of prices received and prices paid index for commodities and services, interest, taxes, and farm wages paid. The July issue includes an annual summary.

Crop Values—Annual Summary, released in February, includes state-by-state estimates for average prices received and the value of production for the preceding crop marketing years for major field and specialty crops.

Source: USDA, NASS