Chapter 1

U.S. Grains – Commodity Descriptions

Corn

Corn is the world’s renewable golden resource. Each year U.S. farmers devote 1 in 4 arable hectares or acres to its production. No other country can match U.S. productivity in growing corn or its efficiency in harvesting corn’s energy potential. The U.S. livestock industry is the world’s most efficient due to the availability of inexpensive, energy-efficient corn. The U.S. grain handling and export industry has evolved into the envy of the world on the strength of ever increasing production.

The same crop has, through its abundance, challenged several generations of entrepreneurs to derive unique products from its component parts, including everything from sweeteners, ethanol and road salt, to packaging products, fabric and golf tees.

Corn has generated all this dynamic economic activity because it has remained abundant and inexpensive, despite the unpredictable ravages of nature through flood, drought and freeze. In real terms, corn prices today are just 35 percent of what they were 20 years ago. Though demand from innovative industrial processes just coming on line is expected to accelerate in the coming years, vast productive capacity remains untapped in the United States. Improved hybrid strains, along with more efficient and ecologically sound farm practices will enable the U.S. producer to meet expanding demand in the 21st century. Most importantly for the consumer, demand is expected to be met in the same environment of stable or declining real prices which have occurred during the last two decades of this century.

CORN USAGE

The principle use of corn, in both the United States and the rest of the world, is in livestock feed. In the United States, corn consumption as animal feed has averaged over 120 million metric tons (MMT) over the last five years. Corn can supply all the energy and a large percentage of the protein in an animal’s diet. Its low cost,
high palatability, availability and consistent nutrient content make it the feed ingredient of choice by livestock producers of every kind. In the United States, where wheat, oats, barley and sorghum compete as feed grains, corn represents up to 86 percent of the grain used as feed. A single metric ton of economical, efficient corn can be converted into .27 MT of beef; .48 MT of pork; or .66 MT of poultry.

Corn is also processed into industrial goods by wet or dry milling. Each corn kernel is separated into three component parts: the germ; starch; and the hull. From the germ comes corn oil. Starch is the feedstock for further processing into ethanol (ethyl alcohol), fructose and industrial starch. The hull, or bran, is combined with residue from these extraction processes to become corn gluten feed or corn gluten meal, which are both prized additions to livestock feed.

Corn gluten meal, the combination of bran fibers and the corn oil cake left from the extraction of corn oil, has protein content in excess of 60 percent and is a low-cost alternative to soybean meal or other expensive protein sources. Poultry feeders particularly value corn gluten meal because of the presence of xanthophyll, a provitamin which determines corn’s pigmentation and enriches the yellow color in a chicken’s skin and eggs. Corn gluten feed is a result of gluten, removed from the heavier starch, being combined with bran from the hull to make a feed ingredient that dairy cattle and sheep find particularly palatable.

For more than 100 years, millers have been devising new products from the chemical manipulation of the refined starch feedstock. Today, products made from corn starch, or its manufacture, include high fructose corn syrup, ethanol, antibiotics, stiffeners for paper, textiles and food, paint, make-up, coatings, films and adhesives. As dextrose, corn becomes the principal ingredient of many processed foods, such as peanut butter, hot dogs and baby food. In the textile industry it finds use, aside from starch, in absorbents, dyes and sizing. The packing industry uses biodegradable corn “peanuts,” while ecologically friendly garbage bags are making their way into U.S. households.

Corn has already made significant inroads into every facet of U.S. leisure and business life. Extensive, ongoing research at the governmental, institutional and corporate levels ensures that the limitless resources of corn will continue to astound us in the future. This marvelous plant, which has been domesticated for 7,000 years, has only begun to demonstrate the broad range of applications it has in our daily lives.
THE CORN PRODUCTION CYCLE:
SEASONAL FACTORS

The versatile corn plant can thrive in climates as diverse as the arid desert plains of the southwestern United States, to the high Andean mountain plains of Ecuador and Peru. But it is in the temperate plains of the U. S. Corn Belt, which include Nebraska, Iowa, Illinois, Minnesota, Indiana and Ohio, where the plant dazzles the agricultural world with its productivity.

Higher yields are strongly correlated with a longer growing season, and hybrids with 110 days or more until maturity are typically planted in the United States. Surprisingly, the topsoil and subsoil moisture content at planting time supplies from 50 to 70 percent of the plant’s moisture needs. Consequently, moisture conditions heading into the spring, when corn is planted in the United States, are very important to potential yield. Crop forecasters base their crop predictions on a formula derived from soil moisture levels before the farmers set out to seed their fields.

Germination and seedling establishment follow quickly upon planting. If the soil is too dry or cold, the seed may not germinate or the seedling may not take root. No amount of rain in the later stages of the growing season will counteract an early loss of a plant population during the germination period.

It is extremely unusual for high levels of precipitation or soil moisture to adversely affect corn production. Wet soils can delay planting and slow maturity. This will expose the plant to additional risk during the pollination period. But standing water or the complete saturation of the soil provides benefits that generally outweigh any risk.

Once established, the corn plant is very strong. Between the seedling and tassel stages, there is very little harm adverse weather or insects can do to the corn plant from which it cannot recover. However, it is in the four weeks surrounding pollination that corn is most vulnerable. Generally, this most critical period of the growing season in the Corn Belt encompasses the entire month of July. After this period, the Corn Belt is safe from damage to production yields. However, during this period, extreme temperatures or drought will prevent pollen from fertilizing individual silks, resulting in fewer kernels on each ear. Hot temperatures during this period inflict much greater harm on the crop than heat in August and September.
Early frosts have a marginal effect on yields, cutting short the kernel filling and drying stages. Extreme cold temperatures at this late stage in the crop’s development are more likely to effect quality than final yields.

Disease and insects are no longer serious threats to U.S. yield potential. The technological advances made by U.S. farm input suppliers in fertilizers, herbicides, insecticides and pesticides have dramatically reduced their impact on corn production.

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U.S. sorghum production is concentrated in the Central and Southern Plains. The states of Texas, Kansas, Nebraska and Missouri produce approximately 80 percent of the U.S. crop.

Unlike corn, the hybridization of sorghum got off to a late start. Only in the 1950s, when a sorghum hybrid of uniform, short stem height became commercially available, did sorghum production really excel. At the beginning of that decade, planted acreage in the United States was only 3.3 million hectares. Since then it has risen as high as 10.9 million hectares.

Like corn, sorghum can be grown under a wide range of soil and climatic conditions. However, unlike corn, yield variance under those different conditions is not so great. Across the corn producing states in the United States, yield can vary as much as .52 MT plus/minus per hectare. With sorghum, yield variance is much less, only .20 MT plus/minus per hectare. Sorghum promises a steady, less spectacular return than corn for feed grains producers. Consequently, it is grown primarily in arid areas of the plains where corn production must be irrigated to be profitable. Sorghum is justly renowned for its ability to survive on limited moisture and to produce during periods of extended drought.
SORGHUM USAGE

Livestock feeding accounts for 97 percent or more of domestic sorghum usage in a given year. Different types of animals use sorghum more efficiently than others. Tannin, an acidic complex found in sorghum, can affect both the palatability and nutritional value. Historically, sorghum was prized for its tannin content because high-tannin sorghum is not palatable to wild birds. Such sorghum is still grown in areas of the world where birds are a threat to the crop.

In the United States, however, sorghum has long been bred to reduce the tannin content, improving nutritional value by as much as 30 percent over alternative origins.

Sorghum has a very hard kernel. This makes it resistant to disease and damage but also requires further processing to enhance its feeding efficiency. Sorghum is ground, cracked, steam flaked, roasted, micronized or reconstituted. Such processing will enhance the nutritional value of sorghum by 12 to 14 percent.

In the United States, sorghum is a principle feed ingredient for both cattle and poultry. The swine industry is not as significant a consumer of sorghum because production is geographically concentrated in the Corn Belt. Sorghum is processed by wet millers and dry millers into ethanol. Wet milling plants are concentrated in the heart of the Corn Belt where transportation spreads discourage the use of sorghum.

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Barley

After corn and sorghum, barley is the third largest feed grain crop produced in the United States. Production in the United States is concentrated in the Northern Plains and the Pacific Northwest. Barley is produced in areas of the United States where the growing season is relatively short and climatic conditions are cool and dry.

Both two-row and six-row barley is produced in the United States. Roughly 65 percent of the U.S. acreage is planted to six-row barley in the Northern Plains and Pacific Coast states. The balance, 35 percent, is planted to two-row barley in the Rocky Mountain states. Universities in the Northern Plains states maintain aggressive breeding programs that continue to produce new varieties that improve the agronomic, feed and malting qualities of U.S. barley.

U.S. barley producers are committed to improving the quality of the inputs that go into barley production in the United States. Most producers plant several of the 100-plus commercially available barley types. Each practices strict varietal purity, preserving the identity of each different variety during seeding, harvest, storage and handling. This combination of innovation and efficiency enables the U.S. barley industry to satisfy the needs of any barley consumer, whether they are a livestock feeder, maltster or food retailer.

BARLEY USAGE

Though most barley in the United States is grown to be malt barley because of the price premium it commands, the bulk of U.S. barley is consumed as livestock feed. With more than 70 percent of the barley planted to acceptable malting varieties in the United States, this means the feed compounder is getting a very high quality product.

The production of malt beverages in the United States has stabilized over the past decade. The brewing industry uses a mixture of two-row and six-row barley in the production of malt beverages. Two-row barley should be a minimum of 85 percent plump, a maximum of 3 percent thin and 11.5 to 13.5 percent protein. U.S. maltsters prefer six-row barley with a minimum of 70 percent plump, a maximum of 3 percent thin and protein levels of 12 to 14 percent. Germination is very important and that of U.S. barley is consistently high. The efficient U.S. handling system ensures that skinned and broken kernels, which reduce germination counts and malt yield, are kept low.
Though two-row varieties are higher in test weight and kernel production plumpness, six-row barley has superior enzyme systems which are crucial to the value of malt in beverage production. Brewers evaluate malt on the basis of total protein, soluble protein extract, fine/coarse difference, diastatic power and alpha amylase. The very high diastatic power and alpha amylase levels in six-row barley make U.S. malt very efficient in the brew house.

Barley is a popular feed grain throughout those parts of the United States where it is grown, or has a clear transportation advantage, such as California. Though barley is not as efficient an energy converter as corn, it does have a higher protein content which reduces the need for protein supplements in a compound feed. Consequently, barley competes very effectively with both corn and sorghum as a feed grain in the United States.

Barley is popular as a staple food. It is used in soups, as an extender for vegetable proteins and is occasionally milled into flour.

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