Alfalfa and Wheat Lead in Yield Per Acre Gains

Robert E. Dennis, Extension Agronomist

Average yields for most of Arizona's forage and grain crops have increased, but progress for alfalfa and wheat has been especially good, Table 1. High-yielding pest-tolerant alfalfas and improved cutting management have been the cornerstone for this crop. High-yielding, stiff-strawed, quality wheats have provided the foundation for advances in wheat production.

Barley is more salt-tolerant than wheat. Medium maturity varieties of barley mature 1-2 weeks earlier than medium maturity varieties of wheat. Use of very early maturity varieties of barley, double-crop with cotton, may result in dramatic increases of barley acreage during the 1980's. The potential average yield of double-crop, very early barley is at two tons or more per acre, and yields of cotton may be increased when barley precedes it.

Sorghum is a warm-season crop competing directly with cotton for scarce water at the lower elevations. In earlier years about half of Arizona's sorghum was grown in southeastern Arizona where high-yielding, full-season, hybrids are used. Much of this sorghum has been replaced with corn. All of the corn for grain in southeastern Arizona is irrigated and yields are high. Average yields tell only part of the story of Arizona's field crop production. Each year some growers obtain yields from most Arizona crops that are more than double the state average. Much of the technology for further increases in field crop yields is already available.

Table 1. Acreage and yield of principal Arizona forage and grain crops by five-year intervals, 1966-1980 1/

	Alfalfa		Wheat 3/		Barley		Sorghum		Corn 4/	
	Harvested (A 2/)	Yield (T/A)	Harvested (A)	Yield (lb/A)	Harvested (A)	Yield (lb/A)	Harvested (A)	Yield (lb/A)	Harvested (A)	Yield (lb/A)
1976-1980	168	6.6	210	4480	48	3620	29	4225	43	5490
1971-1975	206	6.2	198	4055	90	3515	111	4135	12	1860
1966-1970	198	5.5	70	3265	146	3476	199	4280	18	1745

1/ Source: Arizona Crop and Livestock Reporting Service

2/ 1000 acres.

3/ Includes durum. Durum accounted for 69% of Arizona's acreage 1976-1980.

4/ Much of Arizona's corn for grain was produced without irrigation, 1966-1975. Cochise and Graham counties accounted for nearly 75% of Arizona's corn for grain acreage in 1980. All of this acreage was irrigated and the average yield was 6,170 lbs/acre.

FUEL ALCOHOL FROM ARIZONA GRAIN: RESULTS OF A RECENT FEASIBILITY STUDY

by:
James O. Anderson and Russell Schlittenhart

Respectively, Adj. Assist. Prof., Dept. of Plant Sciences, University of Arizona, Tucson, AZ., and President, Arizona Grain, Inc., Casa Grande, AZ.

SUMMARY

A feasibility study supported by a Department of Energy grant considered the construction of an alcohol production plant in Central Arizona. The proposed plant would employ existing ethanol (anhydrous ethyl alcohol) production technology and use locally grown barley and/or wheat as primary feed stocks.

The feasibility study considered:

1) The availability and quality of barley and durum wheat grown in the target area

2) The size and location of the proposed alcohol plant

3) The potential market for the ethanol produced and the by-products (distillers grain and carbon dioxide)

4) The profitability of the proposed plant at current grain and ethanol prices and production costs

A 15 million gallon ethanol plant would consume a significant amount of locally-produced grain and produce large amounts of by-product (see Table 1).

TABLE I.

Alcohol Processing Plant
Total Production And Grain Consumption

DESCRIPTION	QUANTITY* BASELINE AND ALTERNATIVE PLANTS BARLEY	DURUM WHEAT
A. Production		
1. Anhydrous Ethanol	15,000,000 GPY	15,000,000 GPY
2. Denatured Ethanol	15,789,475 GPY	15,789,475 GPY
3. Animal Feed (DDGS)	88,125 Ton/Yr	63,590 Ton/Yr
4. CO_2 (Raw)	47,180 Ton/Yr	47,180 Ton/Yr
B. Grain Consumption	375,000,000 #/Yr	326,087,000 #/Yr
	3,750,000 Cwt /Yr	3,260,870 Cwt /Yr
	187,500 Ton/Yr	163,043 Ton/Yr

*Baseline and Alternative plants have the same production and consumption rates

The dried distillers grain plus solubles (DDGS) is a high-quality protein source (see Table II) and could be used locally in animal feeds (see Table III). The carbon dioxide (CO_2) produced also could be sold within the state.

TABLE II. **Typical Analyses for DDGS**

CORN DDGS [1]		WHEAT (Aldura) DDGS [2]		BARLEY (Gus) DDGS [2]	
Protein	26.5%—27.0%	Protein	34.0%	Protein	21.0%
Fat	7.0%— 8.0%	Oil	8.0%	Oil	1.0%
Fiber	8.5%— 9.5%	Starch (residual)	5.5%	Starch (residual)	4.1%
Moisture	9.0%—12.0%	Sugars (pentosans)	8.7%	Sugars (pentosans)	5.5%
Ash	4.5%— 5.0%	Fiber	7.5%	Fiber	11.5%
		Other	16.5%	Other	40.8%
		Moisture	10.0%	Moisture	10.0%

1. American Feed Manufacturer's Association

2. Based on test-fermented samples from AGI. Analysis by Ralston-Purina

TABLE III.

Potential DDGS Market

NUMBER AND TYPE OF ANIMAL	AMOUNT OF DDGS IN RATION (lbs/day)	MARKET REQUIREMENT (lbs/day)
71,000 lactating cows	8	568,000
469,000 all type poultry	.2	93,800
32,000 breeder swine	.2	6,400
242,000 market swine	.15	36,300
Total for Primary Market		704,500
668,000 cattle on feed	5	3,340,000
Total All Markets		4,044,500

Considering the market for ethanol, DDGS and raw CO_2 and the prices in effect for the period of the feasibility study (late 1980 and early 1981), a 15 million gallon ethanol plant located in Central Arizona would supply approximately 50% of the current market for ethanol at a price of $1.80 to $1.90 per gallon. DDGS would be worth approximately $220.00/ton for wheat and $180.00/ton for barley, reflecting the difference in protein levels. The CO_2 produced could be sold at minimum of $3.50/ton.

The annual average 1980 grain prices for Arizona were $6.87/cwt for wheat (high = $8.75/cwt) and $5.83/cwt for barley (high = $6.50/cwt). Grain prices were projected to increase at 6-8% through the 1980's. With these grain prices in mind and considering the construction cost of the alcohol plant (approximately $40 million), product prices and an internal rate of return of 15%. The price that the above plant could pay for grain would be $6.45/cwt for barley and $7.20/cwt for wheat.

Therefore, one could conclude that an alcohol production facility using locally grown grain is feasible, but marginal. The uncertainty with the above project arises from the recent excess of crude oil on the world market, the increasing water-costs projected for Arizona and the redirection of federal programs in the alternate fuels area.