

Production of Cash Market Grain Sorghum Versus Contracting Hybrid Seed

Richard T. Schad and R. Terry Ervin¹

ABSTRACT

The profitability of producing irrigated sorghum for the cash market is compared to producing two types of irrigated hybrid sorghum seed for sale to seed companies. Partial enterprise budgets are used to estimate profit rates for the three types of sorghum production activities. During the study period hybrid sorghum seed averaged 75.1 and 56.2 percent, respectively, greater revenue per acre than commercial grain sorghum.

INTRODUCTION

Texas' agricultural economy has long recognized sorghum as an important crop. Ranked as the top sorghum producing state in the nation, the value of sorghum production in Texas reached \$472.5 million in 1983 (USDA 1984). Because sorghum's primary use is in cattle feed, producers are limited in their marketing alternatives. Producers must accept prices offered by grain elevators or commercial feedlots. With the exception of target prices all of the price risk involved in sorghum production is assumed by producers because no sorghum futures are traded. Although the plant is easily grown and bears high yields, profits from sorghum production may be small to nonexistent due to the unstable agricultural market.

Past studies of identifying profitable alternative crops for the Texas sorghum producer have considered such diverse crops as sunflower and guayule. Harman, Unger, and Jones (1982) developed production functions for sunflowers and grain sorghum in the Texas High Plains to estimate the yield response to different irrigation levels. Another study compared the profitability of sunflower production to grain sorghum and cotton production in the High and Rolling Plains of Texas (Moore, Lacewell, and Griffin, 1982). Collins, Lacewell, and Heilman (1979) performed a study comparing the profitability of irrigated corn to irrigated and dryland grain sorghum. Cornforth, Lacewell, Collins, Whitson, and Hardin (1980) compared the production of guayule, cotton, and grain sorghum in the Trans Pecos and Winter Garden regions of Texas. Diversifying production enterprises through the introduction of any of these alternative crops, or totally shifting to alternate cropping systems may decrease the price risk carried by sorghum producers.

The capability of a sorghum producer to set a harvest price before or during the growing season would decrease the price risk and uncertainties involved. An alternative to shifting to substitute cropping systems is to obtain a contract to grow hybrid sorghum seed for a seed company. A pricing system is agreed upon by the producer and the seed buyer before production begins. A hybrid seed enterprise can be readily implemented into an existing sorghum producer's operation with minimal cost and few changes in production technique, thus broadening the producer's options and decreasing the risk inherent in farming during depressed economic periods.

In this paper we compare the profitability of producing irrigated sorghum for the cash market (delivered to Continental Grain Company of Gruver, Texas) to producing two types of irrigated hybrid sorghum seed for sale to a seed company (delivered to Dekalb-Pfizer, Moore County, Texas). Our data for the hybrid sorghum were received from Dekalb-Pfizer with no names other than Types I and II. Hereafter, the irrigated sorghum for the cash market is referred to as grain sorghum, while the hybrid sorghums are referred to jointly as hybrid seed, and individually as Hybrid I and Hybrid II. The study uses production and marketing conditions during a four year period (1981-84) in Hansford County, Texas (the center county on the northern border of the Texas Panhandle).

METHODS AND PROCEDURES

A comparison of the profitability of producing grain sorghum and hybrid seed was accomplished by constructing partial budgets and identifying the profit rate for each enterprise on a per acre basis (profit rate was defined as total revenue divided by total variable costs). Determination of total variable costs and total revenue for each production enterprise provided the intermediate results required to identify the respective profit rates. The assumptions made within the study were: a) fixed costs were identical for each enterprise; b) land and climatic conditions were equal for production goals; c) isolation required to insure genetic purity for hybrid seed was accomplished; e) production inputs such as water, fertilizer, seeding rates, and herbicide and insecticide applications were equal between production goals; f) produced grain sorghum met the quality standards of moisture, foreign material, test weight, and damage required to grade number 2; and, g) produced hybrid seed met the contract specified standards of moisture, foreign material, test weight, damage, and germination.

Total Variable Costs

Variable costs were developed for irrigated grain sorghum and modified as needed for the hybrid seed enterprises. Because fixed costs were assumed to be identical for each enterprise they were not included in the analysis. Although some of the variable costs were equal between enterprises they are presented in the budgets to enable the profit rate to be defined. Nitrogen level was set at 180 pounds per acre. Production inputs provided by the seed company for the hybrid seed enterprise were 100 percent of the cost of seed and 50 percent of the herbicide and insecticide costs (these values vary among seed companies.)

Total variable costs were:

$$TVC_i = \sum_{t=1}^{n=9} P_t X_t \quad t = 1, 2, 3, \dots, 9 \quad (1)$$

where TVC_i represented variable costs for year i , P_t represented the price for the appropriate input, and X_t represented inputs seed, fertilizer (N), herbicide, insecticide, irrigation, fuel and lube, repair, labor, and harvest costs.

Total Revenue: Hybrid Seed Enterprise (HSE)

Total revenue per acre of each hybrid seed enterprise was calculated by multiplying the weighted average yield per acre by the average price of the product. Hybrid seed is typically grown with a male pollinator band of four rows to every eight rows of hybrid, or a 1:2 pollinator-hybrid per acre ratio. Because the pollinator was specifically designed for pollination rather than yield, it was expected to produce substantially

¹Richard T. Schad, at the time of the study was a senior in agricultural economics and R. Terry Ervin an Assistant Professor in the Department of Agricultural Economics, Texas Tech University. Texas Tech University College of Agricultural Sciences Publication No. T-1-237. The authors wish to thank Drs. Don E. Ethridge, Ernest B. Fish, and Rex P. Kennedy for their assistance in the preparation of this paper.

less than the hybrid. A weighted average per acre yield for each hybrid was calculated by summing the pollinator yield and twice the hybrid yield and dividing by three. Likewise, the average per acre product price for each hybrid was calculated by summing the products of the prices and yields received for the male and the hybrid crops, and dividing by the total average per acre production.

Total revenue for a hybrid seed enterprise was calculated as:

$$TR_{HSE_i} = A(DAP_i + PP_i) + (1 - A)(MY_i \times CP_i) \quad (2)$$

where TR_{HSE_i} = total revenue received for a hybrid seed enterprise in year i .

A = Ratio of female rows to all rows (ie. 2:3).

DAP_i = Designated acre payment (\$) for year i .

PP_i = premium pounds of female hybrid payment (\$/cwt.) for year i .

MY_i = average male yield per acre (cwt.) was obtained from seed company records for each period.

CP_i = average cash price for November (\$/cwt.) calculated by averaging the cash prices for number 2 yellow grain sorghum (\$/cwt.) during the month of November of each specified year offered by Continental Grain Company in Gruver, Texas

The designated acre payment (DAP) was calculated as:

$$DAP = .5(RF \times NP) + .5(RF \times FP) \quad (3)$$

where RF = regional factor determined by seed company for each sorghum producing region (88 for the study area in year 1981 and 91 in years 1982-84.)

NP = average daily settle price (\$/bu.) of the May (March) corn futures contract price for the month of November, calculated by averaging the settle price of the May corn futures contract for the year 1981 and the March corn futures contract for the years 1982-84 using Chicago Board of Trade prices (Futures Prices 1981-84). The strategy used by Dekalb-Pfizer to price hybrid sorghum seed is based on corn futures prices.

FP = average daily settle price (\$/BU.) of the May (March) corn futures contract price for the month of February, calculated as for NP except the prices used are those reported in February of the given year.

Premium pound payments are designed to reward a grower for superior yields. A grower receives this payment for each hundredweight quantity produced above the target yield established by the seed company. The premium pound payment (PP) is a function of the premium pounds coefficient (PF) defined in the contract by the seed company for each year, and was calculated using:

$$PP = .5((PF \times NP) \times (Y - TY)) + .5((PF \times FP) \times (Y - TY)) \quad (4)$$

where Y = average hybrid yield in cwt.; values obtained from seed company yield records for each period (Howitt 1985).

TY = hybrid target yield (cwt.) determined by seed company, based on expected yield of each hybrid.

The target male yield for each hybrid was multiplied by the average cash price to obtain the revenue for the acres devoted to growing the male pollinator. The revenue associated with the male pollinator acres was multiplied by (1-A) or .33 to develop a weighted revenue value based on the ratio of two female acres to one male acre.

Total Revenue: Grain Sorghum (GS)

The net returns over variable costs for each enterprise were calculated by subtracting the total variable costs from the corresponding total revenues for each year. Net returns from grain sorghum were compared to each of the net returns associated with the two hybrid seed varieties. Total revenue for the grain sorghum enterprise was calculated as:

$$TR_{GS_i} = SY_i \times CP_i \quad (5)$$

where TR_{GS_i} is the total revenue received for the grain sorghum enterprise in year i , SY_i the average yield of grain sorghum (cwt.) for specified years in Hansford County, Texas

(Texas Crop and Livestock Reporting Service, 1982-85), and CP_i the cash price paid by Continental Grain Company in year i .

To compare over time, net returns were converted to constant 1984 dollars.

RESULTS

Table 1 summarizes total revenue, variable costs, and net returns (in nominal dollars) on a per acre basis for each of the enterprises considered.

Table 1. Revenues, Variable Costs, and Net Returns (in nominal dollars) Per Acre for Hybrid Seed and Grain Sorghum Production

Enterprise	Year				
	1981	1982	1983	1984	Average
Hybrid I					
Revenue	402.80	364.49	398.44	371.14	384.02
Var. Costs	142.63	177.38	177.97	201.72	174.93
Net Returns	260.17	187.11	220.47	169.42	209.09
Hybrid II					
Revenue	340.15	371.80	344.87	313.94	342.69
Var. Costs	142.63	177.38	177.97	201.72	174.93
Net Returns	197.52	194.42	166.90	112.22	167.77
Grain Sorghum					
Price/Cwt.	4.58	4.51	5.22	4.60	4.73
Revenue	199.19	213.45	221.68	243.13	219.36
Var. Costs	151.78	192.49	193.07	216.82	188.54
Net Returns	47.41	20.96	28.61	26.31	30.82

Revenues produced by Hybrids I and II were consistently higher than those associated with grain sorghum. Over the four year period, Hybrids I and II averaged 75.1 and 56.2 percent greater revenue per acre than grain sorghum, respectively. Variable costs per acre for the hybrid enterprises were slightly below the grain sorghum enterprise because of the shared expenses the seed company assumed. During the four years under study, variable costs of the hybrid enterprises averaged 7.3% less per acre than grain sorghum.

The profit rates averaged 120% for Hybrid I; 96% for Hybrid II; and 16% for grain sorghum. The large rate was due chiefly to the higher value of the hybrid. Net returns for Hybrids I and II in constant dollars (1981 prices = 100) averaged 6.75 and 5.43 times, respectively, greater net returns than grain sorghum.

Table 2. Net Returns in Constant (1981) Dollars

	Year				Average
	1981	1982	1983	1984	
Enterprise					
Hybrid I	260.17	176.30	201.26	147.98	196.43
Hybrid II	197.52	183.19	152.36	98.26	157.83
Grain Sorghum	47.41	19.75	26.12	23.04	29.08

CONCLUSIONS

The principal objective of this project was to compare the net returns of two hybrid seeds and irrigated grain sorghum production. This study shows that the hybrid seed enterprises result in considerably higher net returns per acre than the grain sorghum enterprise.

An initial conclusion is that a producer would wish to divert all acres under his/her control to hybrid seed production. The limiting factor on hybrid seed production is the isolation requirement. Realistically, isolation becomes difficult due to the barrier distances required around the perimeter of a field to insure genetic purity. Unless a producer could devote the surrounding acreage to a genetically dissimilar crop which produces acceptable net returns per acre, the barrier acres would become unproductive. Consequently a producer must control a large block of land to grow even a small field of hybrid seed. However, this study indicates that producers

in such a situation would find hybrid sorghum production economically advantageous if arrangements with seed companies are available.

The analysis considered only average or typical conditions for yields, input levels, climatic conditions, quality standards, and prices. Changes from these conditions over time or across farms will alter the results obtained in this study. Other limiting factors in the study are that government deficiency payments were not included, and only the policies of a single seed company were used.

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