THE POTENTIAL FOR GUAR, SESAME, CASTORBEAN AND SOYBEAN PRODUCTION IN HARMON COUNTY

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THE POTENTIAL FOR CORN, SORGHUM, CATTLEMEN AND SOYBEAN PRODUCTION IN RALEIGH COUNTY

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INTRODUCTION

The total economy in Harmon County is primarily of an agricultural nature, with 70 to 90 percent of its income derived from the sale of farm commodities. This total agricultural income is tied closely to two cash crops, wheat and cotton. In recent years, acreage allotments have reduced the acreages planted to these crops. Income opportunities have been further reduced by lower prices for wheat and cotton and rising cost of farm production items.

Farmers are finding it increasingly necessary to recombine or increase their resources and where land is not available for purchase or the price is too high, it becomes necessary that equipment be utilized to a greater extent throughout the year. This might be accomplished by growing other crops that adapt themselves well to present farming operations.

The purpose of this study was to survey the potential of guar, sesame, soybeans and casterbeans, referred to as new or specialty crops for Harmon County. It is the hope of the author to uncover some of the reasons for the lack of interest in growing these crops, and the erratic fluctuation of acreages from year to year. The material reported will be of great value to the author in serving the farmers and businessmen interested in producing these crops, and will help to answer numerous inquiries from these people as they search for crops to grow on land not planted to cotton and wheat because of restricted acreage

acreage allotments. The problem is to find a crop that can be grown and marketed at a profit.

This study provides information that will help farmers adjust their resources and make more profitable use of non-allotment diverted acres through the use of such crops as guar, sesame soybeans and castorbeans.

REVIEW OF LITERATURE

Guar

Guar is a drought-tolerant summer annual legume that was first introduced into the United States from India in 1903 (17). According to Symonitz and Matlock (5) the earliest record of guar being grown in Oklahoma involved plots grown in 1941. The center of guar production in the United States was in Southeastern Texas, later moving to North Central Texas and Southwestern Oklahoma (5). Farmers in these areas are being invited to take a new look at guar (16). This new look reflects that bean color (blackening of seedcoat) is no longer a critical factor in marketing so long as the beans are fully developed and plump, and also reflects a boost in price of one-half cent per pound (13).

Evaluation studies to determine the potential of guar as a crop for Oklahoma were conducted by a committee of staff members at Oklahoma State University (2). Guar seed was described as an important source of mannogalactan gum, used as thickening agents for textile printing pastes, salad dressings, ice cream mixes, bakery products, and other foods. Because of their strong hydrophilic (water loving) character, they are excellent additives for paper manufacture. The gum has been used in oil well drilling muds, ore flotation processes, and pharmaceuticals.

According to Symonitz and Matlock (5), numerous semi-popular articles have been published by commercial people, Soil Conservation Service

personnel, and other interested individuals. All described one or more of the following attributes of guar:

1. The crop controls wind and water erosion.
2. Plants of guar are resistant to drought.
3. The crop raises the fertility level of the soil.
4. Guar plants increase the water intake and water-holding capacity of the soil.
5. The crop increases the yields of the following crop.
6. The protein in the beans can be used as a feed supplement for cattle.
7. The beans can be sold as a cash crop.

Attributes one through five have never been scientifically proven or disproven. Concerning attribute number six, a number of studies have been conducted with the use of guar for feed purposes. Hellvain and Baker (8) conducted a study at Woodward, Oklahoma, to ascertain the feeding quality of guar beans, and to make observations on the growing of guar near Woodward. Preliminary results of feeding rolled guar beans to weaner steer calves on winter range indicate the beans were comparable in feeding value with cottonseed supplements when similar quantities of protein are fed.

Steers supplemented daily with 3.33 pounds of rolled guar beans containing 26.4 percent protein during a 136-day wintering period in 1953-54 gained 17 pounds more and 21 pounds more yearlong than steers fed a daily ration of 1.9 pounds of 41 percent protein cottonseed pellets.

Steers fed a daily winter ration of 2.8 pounds of rolled guar beans containing 32.27 percent protein during the 179-day winter feeding

period in 1954-55 gained 12 pounds less in winter but eight pounds more yearlong than steers fed a daily ration of 1.91 pounds of 41 percent cottonseed pellets. In the 1954-55 study, steers fed a daily ration of 1.87 pounds of rolled guar beans made 40 pounds less winter gain and 49 pounds less yearlong gain than the steers receiving 1.91 pounds of cottonseed pellets.

Cultural studies (8) conducted in 1954 and 1955 at Woodward verify that guar is a drought-tolerant plant; however, bean yields were low and further trials will be necessary to learn if guar has an economic value in the Woodward area. Guar does not appear to be well adapted for aiding in the control of wind erosion as most of the plant is removed during harvesting. Soil moisture studies indicate that guar has a higher water requirement than milo. It requires a growing season of about 125 to 135 days to reach maturity, appears to best adapt to dryland farming, and thrives on brown and light brown loams and sands with clay to sandy subsoils (2). According to Staten and Brooks (17) guar should be planted during May or June, on level ground or on a slight ridge in 36 to 42 inch rows. The inoculated guar seed is planted at a rate of five to six pounds per acre and one to one and a half inches deep.

Northwest of Harmon County, guar was planted for observation on the Big Spring (Texas) Field Station in the late forties (14). It grew well, but the stalk was too woody and the foliage too scant to make it the equal of cowpeas as a green manure crop. Recent interest in guar seed has led to a resumption of plantings at this station, but seed yields during adverse years have not been encouraging, and the foliage

was injured considerably by a mosaic disease.

Variety trial information from Oklahoma indicates that yields for Groehler - 2 and Texsel varieties ranged from 366 to 1,900 pounds per acre with an average of 909 and 801 pounds per acre, respectively. With more know-how it would be possible for growers to easily produce 2,000 pounds of seed per acre (2). Yield information (9) available from the Sandy Land Station in Greer County, located northeast of Harmon County, indicates a wide range of yields have been obtained, as shown in Table I.

TABLE I

GUAR SEED YIELDS PER ACRE - MANGUM

Variety	Seed Yields Per Acre - Mangum 1960	1961
Texsel	592.7	484.0
Groehler - 2	649.7	912.0
P.I. 164801	952.3	956.3
P.I. 183400	875.3	1,027.7
P.I. 179930	884.3	945.3
216479		457.7
P.I. 212986		430.7

A new variety of guar, named Brooks, had been approved for joint release by the Oklahoma and Texas agricultural experiment stations and USDA (7). Advantages of Brooks include high yield and resistance to two principal diseases of guar, bacterial blight and Alternaria leaf spot. It is expected to be adapted to sandy soils in Southwestern Oklahoma. Certified seed of Brooks is expected to be available for general farm planting following the 1964 harvest.

In 1962 and 1963, Brooks averaged 1,283 pounds of seed per acre, 431 pounds more than the average of the commercial varieties, Groehler

and Texsel. The tests included four locations in Oklahoma and four in Texas.

The new variety originated from the progeny of a single plant selected in a field of Groehler in 1959 at Iowa Park, Texas. Brooks can be easily distinguished from Groehler and Texsel by its branching habit of growth and by the absence of hairs on stems, leaflets, and pods. Pods of Brooks tend to set higher off the ground than those of Groehler and Texsel, which should result in lower harvest losses.

Sesame

Sesame is a summer annual requiring a growing season of 120 to 135 days and best adapted for a sandy to fine textured soil (2). It produces seed containing approximately 50 percent oil which is used in the manufacture of cooking oils, margarine and shortenings. Sesame meal or cake contains about 50 percent protein and is used as a supplement in poultry and livestock feeds (11).

The crop has been grown for centuries in Asia and Africa, and is produced on a large scale in Latin America. In the United States, sesame has been produced commercially only since 1950 (11) but has been increasing since World War II.

Sesame varieties are classified as either shattering or non-shattering (11). In Oklahoma the mean yields of sesame have averaged 1,365 pounds of seed per acre on the station near Mangum and 890 pounds on the station near Tipton (10). In 1963, Matlock (10) presented information indicating the top producers for 1960-63 were Margo, Oro and Dulce, all three shatter types, producing 1,400 to 1,700 pounds of seed per acre. The non-shatter strains were very low yielders.

Sesame is adapted to many types of soil, but it thrives best on well-drained, fertile soils of medium texture and neutral reaction. It is not a soil building crop, but it does appear to improve soil structure. This is probably due to the loosening effect of the feeder-root system (11). General recommendations (1) for sesame production in Southwest Oklahoma lists the variety Margo as the first choice. It is a non-branching, shatter type, with some resistance to bacterial leaf spot. Dulce and Oro are two other recommended varieties. Seeding dates extend from May 15 to June 15, planting with vegetable planter boxes with nylon knock-outs. The seeding rate is one to two pounds per acre, using seed that has been treated with one ounce of 75 percent captan per 100 pounds of seed. Cultural practices are similar to those used with cotton, including about the same type of fertilizer program and similar weed control measures. Insects that may become a problem include bollworms, aphids and thrips. An adequate irrigation system includes pre-irrigation, additional watering during the blooming and fruiting periods, and discontinuing watering after blooming stops.

During the years 1954 through 1960, domestic shatter-type sesame prices have ranged from 9.6 to 10.8 cents per pound. The main reason for this lack of price variability is that the Growers' Organization carefully limits acreage to expected needs (2). The low prices received in some years is a good reason for Oklahoma farmers to consider contracting the crop rather than raising it without a contract (2).

Soybeans

Soybeans may be produced in the southwestern part of Oklahoma only with supplemental water. Some varieties that have given the best performance

in tests near Chickasha and Altus have been Hill, Hood and Lee (6). Yields of the Hill variety have ranged from 34 to 43 bushels per acre at Altus, while Hood and Lee varieties were better than Dorman and Ogden.

Variety tests conducted at Altus and Chickasha show that there are possibilities for soybean production in Southwest Oklahoma as an irrigated crop. Oklahoma Agricultural Experiment Station recommendations (16) indicate that soybeans are adapted to fertile--clay loam to clay--soils, with the seedbed and other cultural practices being similar to those required for cotton, planting dates ranging from May 20 to June 10. Amiben, DCPA, MPA and Limuron applied as pre-emergence herbicides have given excellent weed control in soybeans. Fertilizer consisting of rates similar to that recommended for cotton may be broadcast and plowed down or sidedressed to the side and below the seed at planting time or in the pre-bud stage. Irrigation procedures follow very closely, those of cotton, from fruiting until maturity. Combines, with proper adjustment, do a good job of harvesting soybeans.

The economic position of soybeans in the world market is given in The Farm Index (4). More U. S. edible vegetable oils are going abroad. About 2.1 billion pounds were shipped out by the end of the 1962-63 marketing year. During 1961-62, exports of edible vegetable oils amounted to 1.8 billion pounds. Most of the increase in 1962-63 was in soybean oil, with little change in shipments of cottonseed oil. The Food for Peace program (all Titles of P.L. 480) was behind most of the increase for 1962-63. About 1.2 billion pounds of edible oils moved under these programs, with the rest sold for dollars. P.L. 480 shipments in 1961-62 totaled one-billion pounds. Most of the program oil was sold for

foreign currency (Title 1) to countries such as Pakistan, Turkey, Egypt, Israel, Morocco and Tunisia.

Of the 2.1 billion pound total for 1962-63 exports, soybean oil hit a record 1.6 billion pounds, a fourth more than previous years.

In addition to the expanded Food for Peace program, exports have increased because of much smaller exports of copra and coconut oil recently, and reduced exports of oilseeds from Red China. Continued growth of population and stronger economies in buyer nations also helped create demand for U. S. edible oils.

Castorbeans

Castorbeans are the seeds of the castor plant and are not true beans since the castor plant belongs to the Euphorbiaceae family (3). The plants are grown mainly for the seeds which contain about 50 percent oil. The oil is used in the manufacture of many products for both military and civilian uses. Military uses include the preparation of jet engine lubricants, hydraulic and gun recoil fluids, general-purpose lubricants, and plastics for coating wire, fabrics and other military equipment. It is also used in the manufacture of paints, lacquers, varnishes, artificial leather, nylon, cosmetics, special low-temperature lubricants and flexible coatings.

Since castor oil is a strategic material which is essential for military and defense purposes, domestic production of castor beans is being greatly expanded. The acreage goal in Oklahoma for 1952 was 60,000 acres which was approximately twice the acreage harvested in 1951.

Castorbeans require a growing season of 160 to 180 days and the

equivalent of at least 15 to 20 inches of rainfall during the growing season (April through September).

Castorbeans are best adapted on deep, permeable soils which will hold large amounts of water and permit good root development. The soil should be well-drained, at least medium in fertility, and not subject to severe erosion. Soils varying in texture from sandy loams to loams are most desirable. Shallow solid, and those with dense clay sub-surface layers, are not suitable for castorbean production.

In general, castorbeans will do best on bottomland soils of medium fertility and on the more productive upland soils which are normally planted to corn or cotton.

The successful production of castorbeans under irrigation (15) is dependent upon the amount of rainfall received during the growing season. Production areas in California and Arizona usually require 30-40 inches of irrigation water. However, they receive little if any rainfall during that time. In Oklahoma, 15 to 25 inches may have to be applied, depending on the amount and distributinn of rainfall, temperatures, water-holding capacity of the soil, and other factors. It may require from three to six applications of water, again depending on the above conditions. The total water requirements are probably about the same as for cotton. However, the time of application may be different. Castors begin fruiting earlier than cotton and as a result, may require an earlier watering. For maximum yields, the plants should not be allowed to wilt during morning hours. Plants in such extreme stress will produce blasted and poorly-filled seed and will shed their leaves. When this occurs, plants may be stunted, yields and seed quality will be lowered and the

loss of leaves will allow weeds and grasses to grow. Irrigation water should be applied only in furrows between rows after the plants are up. Care should be taken to make sure they are not over-watered. Over-watering will cause wilting the same as too little watering. Listed in Table II are cost per acre production figures given by Sewell (12).

TABLE II

CASTORBEAN PRODUCTION COST PER ACRE

Item	Cost
1. Irrigation (6 @ $1.80)	$10.80
2. Hand hoeing	3.50
3. Insect control	1.80
4. Planting seed	2.40
5. Cultivation	12.00
6. Harvesting and transporting to elevator *	22.00
7. Cost of fertilizer	6.00
	$58.50

*Based on 2,000 lb./ acre yield or $1.00 per hundred for custom harvesting plus $2.00 per acre for transporting from field to elevator.

Results for the irrigated castorbean tests were conducted during 1957 to 1961 on the Irrigation Experiment Station near Altus and were repeated by Smith et al. (13). Variety tests have been conducted at Altus each year since 1957, but one test was not harvested for yield. A hailstorm in June, 1960 reduced stands, but the surviving plants recovered. However, in October, 1960, the test was completely destroyed by hail. In 1959, the test was not planted until June 5 which was 30 to 45 days later than the optimum date at that location. Therefore, yields were reduced by the short growing season.

In three of the four years that tests were harvested, yields avereged

over 2,000 pounds per acre. The mean yield for Dawn, the only strain occuring in all four tests near Altus was 1,920 pounds per acre of seed with an average test weight of 40 pounds per bushel and oil content of 50.7 percent. In 1961, the test contained all dwarf entries and averaged 2,351 pounds of beans per acre. Yields ranged from 2,163 to 2,645 pounds per acre. High yields, coupled with high oil content in 1961 was indicative of variety improvement and good growing conditions.

Non-irrigated tests (13) were conducted at the Sandy Land Research Station near Hanger, starting in 1960 with normal intermode varieties and hybrids making up most of the entries. No significant differences among yields were obtained in the two years of testing at this location. A mean seed yield of 979 pounds per acre was obtained after frost by the usual single harvest method. In 1961, the plots were hand-harvested on three dates and the mean seed yields for the test was 1,210 pounds per acre. Hand harvesting at three dates saved the seed produced by different varieties, but it did not give an estimate of the ability of the strains to retain their seed until frost.

According to a recent report in the Farm Index (4), the production of castorbeans is expanding again. About 23,500 acres were harvested in 1962. With yields of 1,434 pounds per acre, output was roughly 34 million pounds of beans (hulled basis). In the 1940's, farmers just about abandoned the crop. The market price and yields were low and harvesting was done by hand. However, mechanization of production, improved dwarf intermode hybrids and varieties, and extensive irrigation increased yields five-fold during the 1950's. Producers in Texas accounted for three-fifths of the total output in 1962, with the rest coming from

Arizona, California, New Mexico, Kansas and Nebraska. Although domestic castorbean production has fluctuated since the 1940's, industrial demand for castor oil has remained fairly steady. Since the mid-1950's, domestic consumption has held at an average annual rate of 139 million pounds.

METHODS

This report concerns a study of new or different crops that have or can be grown in Harmon County.

The information was secured through surveys, personal interviews with farmers and business people, research bulletins from state agricultural experiment stations, U. S. Department of Agriculture and commercial concerns.

To secure additional information, personnel associated with the Agronomy Department of Oklahoma State University were interviewed. Excellent cooperation was received while securing this information.

RESULTS OF SURVEY

Guar

In September, 1953, a group of twenty farmers, businessmen, and agricultural agency representatives from Harmon County made a tour of the Vernon, Texas, area and came back home convinced that guar is a soil builder.

The acreage planted to guar in Harmon County each year since 1952, the first year an appreciable acreage was grown, has probably never exceeded 5,000 acres with the 1963 crop estimated at 200 acres. In 1955, approximately 3,500 acres of guar were planted, with yields ranging from three to eight hundred pounds per acre. Approximately 150,000 pounds of seed were marketed in 1959. The 1960 crop was hampered by heavy rains at harvest time, but a substantial amount was marketed somewhat below the top price of $3.40 per hundred. Farmers in the area were offered $4.00 per hundred, F.O.B. Kenedy, Texas, for No. 1 guar beans in 1963.

Planting time in Harmon County is about the same as for cotton. Some farmers like to get started just as soon as the cotton is up and growing well. This delays the harvest until after the cotton harvesting rush is over.

Farmers found Johnson grass was more difficult to control in guar than other crops when guar was planted in Johnson grass infested fields. They also found that guar's prostrate growth in its early stages made

cultivation very difficult and increased the silting hazards from heavy furrow-filling rains.

A Harmon County farmer found that cotton following guar on sandy land produced one-fourth to one-third more than continuous cotton. Similar results were obtained when grain sorghum followed guar. Alternating guar and grain sorghum in four-row strips, and then reversing the crops the following year, convinced a number of farmers of the value of guar when they observed the extreme up and down effect presented by the taller and heavier stalks and grain heads in the four rows following guar.

One of the greatest hazards growers have experienced were the fall rains that burned the seed black and lowered the market price. In 1957, most of the producers sold or fed their entire crop to livestock because of the weather damage.

In 1959, another county farmer sowed part of his land to guar in August just for protection against the wind and to provide organic matter. It made excellent growth before frost and provided the needed soil protection.

Most farmers in the county agree that guar is easy to plant and harvest. The grain sorghum row planter is used to plant five to six pounds of seed per acre in rows spaced 40 inches apart. Guar is cultivated similar to cotton and at about the same time. The Crockler variety which matures later and is more bushy, seems to do better than Texsel in the Hollis area. Brooks may prove to better than Crockler.

The cash return from guar to Harmon County farmers netted as much or more income than grain sorghum. Yields average about 700 pounds per

acre, with the better land producing as high as 1,200 pounds per acre. The market price will average about $3.00 per hundred later in the season, while earlier in the season $3.40 is the usual price. A regular combine will harvest the crop with custom operators doing the job for an average of $2.75 per acre. Marketing points for Harmon County farmers have been in Mangum, Oklahoma, and Wellington and Quannah, Texas.

It appears that guar resulted in fewer dollars per acre than wheat or cotton. Yields ranged from 300 pounds of seed per acre up to 1,200 pounds, with an average around 700 pounds. No. 1 seed was selling for $3.14 per cwt. That is $20.30 an acre for average yields. More recently, General Mills has announced a 50 cent cwt. increase for the 1963 crop.

One Tillman County grower who kept good records reported that he netted $13.00 an acre on guar in 1958 and $7.00 in 1959. Some farmers like guar better than sweet clover because it is a three-way crop, i.e. for soil building, seed and feed.

Sesame

Sesame has been grown in Harmon County for at least three years but was produced commercially for the first time in 1955. Two observation demonstrations were established in 1953 and 1954.

In 1955, 42 acres of sesame were grown one mile south of Vinson. In conversations with two growers, it was noted that they saw two benefits from the new crop. Added income, as it paid more than grain sorghum and other similar crops grown here, and benefit to the soil, in that sesame has a long tap root that will break through the plow pan, and also massive secondary roots. Since it has proved drought-tolerant, they

thought it would be popular for low rainfall areas. The crop was seeded with a lister planter using a vegetable box attachment on land normally planted to cotton or feed. Cultivation was about the same as for cotton or feed. The success shown on the two dry-land farms was encouraging so production should not be ruled out in future development of crop irrigation in Harmon County.

Cost of planting was another encouraging factor since only 1.5 pounds of seed were required to obtain satisfactory stands per acre and planting seed cost was around 75 cents per pound. Yields were good, ranging from 800 to 1,000 pounds per acre. The producers received an average of ten cents per pound.

Soybeans

Soybean production in Harmon County has been limited in the past to three instances, 1956, 1957 and 1958. Using the more successful of the three crops as an example, the average yield was 32 bushels per acre on a 30 acre irrigated field. The producer experienced no special problems using regular cotton farming equipment in seed bed preparation and in planting the crop. Irrigation water was applied twice during the fruiting period, and the field was harvested after frost without any difficulty. The big problem came when a market was sought for the crop. After some delay, the beans were hauled to Lubbock, Texas, and marketed at $1.97 per bushel. Other problems experienced by this grower included a heavy infestation of cotton bollworms in one part of the field, and extreme difficulty in following the soybeans with another row crop. This was due to the loose condition of the soil following the soybeans. The

two other known instances of soybean production were total failures because of lack of irrigation water, and dry, hot weather.

Castorbeans

Harmon County was producer of castorbeans several years ago before the advent of irrigation into the farming picture. No record of castorbean production under irrigation is available, and information available on dry-land production is non-conclusive.

SUMMARY

The purpose of this study was to evaluate the potential of four specialty crops, guar, sesame, soybeans and castorbeans, with respect to agronomic practices, farmers' experiences with these crops, research information, and some of the problems involved in their production.

The data used in this study was assembled during 1963 and 1964.

Presently, guar seems to have the greatest potential, with fewer production and marketing problems than the others. One of the greatest problems is the failure to secure seed yields that will make it more economically sound than its closest competitor, grain sorghum. It is difficult to explain the decline in acreage over the past few years, but part of it could possibly be attributed to weathering of the seed at harvest time, resulting in lower prices received.

An increase in the sesame acreage in the future will depend to a great extent on the price remaining at the current level, the development of a high-producing, shatter-proof variety, and more complete mechanization of production practices.

Increased acreages of the soybean and castorbean crops in Harmon County will be limited to irrigated land where they will be in competition with cotton for irrigation water during critical periods of seed development.

The greatest problem cited by area farmers is that of trying to produce profitable crops with limited and often poor seasonal distribution of rainfall.

In Harmon County the average rainfall is 2.00 inches per month over the 12 month period. Sixty percent of the annual moisture comes during the six months from April through September. The months of heaviest rainfall are May, September, June and October. The months of lowest rainfall are January, February and November.

Another important problem is wind erosion. Reducing wind erosion damage is as important to profitable crop production as is conserving moisture. Rotations or cropping practices suitable for moisture conservation should be further evaluated for their effect on probable wind erosion damage. If fields are allowed to become eroded and the topsoil lost, moisture storage will not compensate for the reduction in soil productivity. Some crops that otherwise might be profitable are abolded because they leave so little residue that danger of serious wind erosion damage is increased.

Organic matter depletion is also a potentially important problem. Heavy losses of organic matter and nitrogen have taken place during the comparatively short time these soils have been under cultivation. Up to the present, this probably has not affected crop yields. It would seem, however, that the problem demands serious study before it becomes acute.

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