SUPPLEMENTAL VEGETABLE CROP MIXES FOR A COW-CALF AND GRAIN PRODUCER IN BRYAN AND ATOKA COUNTIES IN OKLAHOMA

By

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CHAPTER I

PROBLEMATIC SITUATION

Introduction

The first half of the eighties has not been generous to American farmers and agricultural based economies. Foreclosures of family farms are reported frequently in the news media. However, the financial crisis is neither new nor news to the residents of Atoka and Bryan counties in Oklahoma. For many years these two Southeastern Oklahoma counties have been among the most economically depressed counties in the state. In 1980, Atoka and Bryan counties ranked seventy-sixth and sixtieth respectively out of the seventy-seven Oklahoma counties in medium household income. Over the past half century, their per capita income has lagged behind the Oklahoma average and until recently, has never been higher than seventy percent of the national average (Mize and Walner 1981). In 1983 per capita transfer payments for each of the two counties was 12 percent higher than the state average (US Dept. of Commerce 1983).

Over sixty percent of the business proprietors in the two counties are farm proprietors, therefore, maintenance and growth of the economy is highly influenced by revenues generated in the farm sector. Farm income can be viewed as a function of physical productivity, input costs and the price of the outputs. Since the costs of inputs and the prices of outputs are determined by the market forces of supply and demand, and these forces are beyond the control of a single farmer, his role in farm management is limited to the choice of enterprises to produce and how to produce them. In making sound economic plans, producers should evaluate a variety of enterprise alternatives. Peanuts, cattle, and grain sorghum are the three most common (by value of sales) agricultural enterprises in Bryan and Atoka counties. Many vegetable enterprises may return a higher per acre profit than conventional row-crop and livestock enterprises. Economic analysis of a hypothetical farm which includes vegetable enterprises along with traditional enterprises might point out profitable alternatives that increase farm revenue.

Fresh Vegetables: an Overview of SUPPLY and DEMAND

United States per capita consumption of fresh vegetables has escalated from around 96 pounds in the early 70's to over 105 pounds in the early 80's (USDA 1984). Demand for any one fresh vegetable crop is affected by the price of the vegetable, price and availability of substitute and complementary food goods, number of consumers, their tastes and incomes. Improved opportunities for increasing vegetable production are a result of a shifting retail demand curve. Perhaps the shift can be attributed to a higher use of salad bars in restaurants, an increasing desire to consume "healthy foods," and rising real per capita income of American consumers.

Problem Statement

To increase the low farm incomes, alternative or supplemental agricultural enterprises need to be considered. Among numerous nontraditional enterprises, vegetable production shows great potential in terms of producer interest and profitability. There has not been a detailed economic analysis of implementing vegetable enterprises into existing farm plans. Most vegetable enterprise budgets developed at Oklahoma State University for Southeastern Oklahoma show relatively high returns above operating cost. However, the feasibility of producing vegetable enterprises with traditional agricultural enterprises is unknown. High capital requirements, marketing uncertainties, intensive production requirements, yearly, seasonal and weekly price variations, yield variations, and management objectives pose practical problems.

Production enterprise budgets developed by farm management personnel at Oklahoma State University have monthly intervals for the production inputs. For a realistic analysis, enterprise budgets need to be developed to more accurately reflect the variation of input use over the growing season and the management intensiveness of vegetable production.

Production and marketing risk are important factors in farmers' decisions because of the tradeoffs between higher returns and higher risks of many crops, and lower returns and lower risks of other crops. Just (1974) identified three sources of risk and uncertainty in agriculture (1) risk associated with environmental and technological factors such as weather and improved varieties; (2) risk associated with market factors such as price fluctuations and (3) uncertainty with respect to policy changes such as government programs and pesticide regulations. The level of risk a farmer chooses is dependent on his financial and management objectives.

Objectives of Study

The purpose of this study is to investigate the economics of supplementing income on beef cow and grain farms in Bryan and Atoka counties with limited commercial vegetable production. The specific objectives are as follows:

1. Calculate cost and returns of vegetable enterprises for farms in Bryan and Atoka counties of Oklahoma.
2. Calculate the coefficient of variation of vegetable crop enterprises and classify them according to the risk associated with net revenue variations.
3. Determine enterprise combinations that will maximize profits of farm operations with different types of farm organizations.
4. Examine product mix sensitivity to changes in product prices for the farm operations in Atoka and Bryan counties.

Area of Study

Location

Atoka and Bryan counties are located between Oklahoma City and Dallas in the southeastern quadrant of Oklahoma (Figure 1). They are bordered to the south by the Red River, on the west by Marshall, Johnston, and Coal counties, on the north by Pittsburg county, and the east by Pushmataha and Choctaw counties. The combined population in 1980 for the study area was 43,000.

Water Source and Temperature

Successful vegetable production requires timely water application.

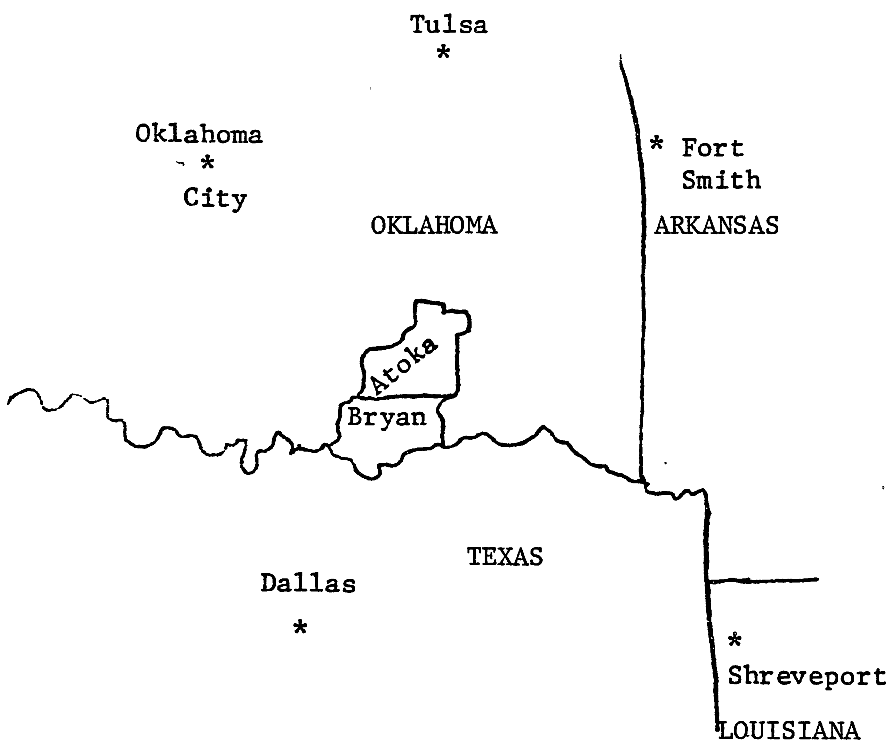

Figure 1. Area of Study

The average annual rainfall is 40.8 inches with an uneven distribution throughout the year. Table I lists the monthly distribution of rainfall and the average temperature in Atoka and Bryan counties. Irrigation is needed to supplement the rainfall during part of the growing season. The southern half of Atoka county and all of Bryan county is supplied by the Antlers Sandstone Aquafer. Wells from this aquafer yield between 10 and 50 gallons per minute with reports of up to 400 gallons per minute.

The temperature in Atoka and Bryan counties is classified as semi humid. The summer temperature is extremely hot and relatively dry and the winters are too cold for successful vegetable production. The growing season is long enough for most commercial vegetable crop production.

Soils

There are three soil orders as described by Gray and Roozitalab (1976) in the study area. The "vertisols" are a clayey soil that develop large cracks during the hot and dry periods of the year. Vertisol soils are found throughout central Bryan county and southern Atoka county. The soils are currently being used for native and improved pasture and small amounts of cropland.

The "mollisols" soils are a brown silt loam soil that are used for cropland and improved pasture. The mollisols are found on the Red River bottoms in southern Bryan county.

The "ultisols" are a mature soil in which leaching occurs. They are high (52%) in sand content and are relatively infertile. Ultisols are found in eastern and northern Atoka county and are used for timber, native pasture, improved pasture and limited cropland.

TABLE I

AVERAGE TEMPERATURE AND PRECIPITATION IN ATOKA AND BRYAN COUNTIES

	Ave. Temperature in degrees		Ave. Precipitation in inches	
Month	Atoka	Bryan	Atoka	Bryan
January	41	42	1.7	1.9
February	45	46	3.0	2.8
March	53	53	3.2	3.0
April	63	64	5.1	4.9
May	70	71	4.8	5.3
June	77	79	4.1	4.0
July	82	83	2.5	2.9
August	81	83	2.6	2.5
September	74	75	6.1	4.5
October	64	65	4.1	3.4
November	53	54	2.8	2.7
December	44	44	2.2	2.4
Year	62	63	41.4	40.3

Source: Soil Survey of Bryan County, Oklahoma and Soil Survey of Atoka County, Oklahoma.

There are several soil types in the study area that are suitable for fresh vegetable production. There is an estimated 237,500 acres of sandy-loam soils, with less than three percent slope in the two counties (USDA, 1978, 1979). Although it is not possible for all of these acres to be in vegetable production, quality soil is not a constraining factor in the near future.

Procedures

With the help of Oklahoma State University extension horticulturists, vegetable budgets with weekly resource requirements will be developed. Extension publications of experiment station test data will be used to determine resource parameters for production requirements. A machinery complement suitable for vegetable production will be assumed available.

The coefficient of variation (CV) allows a comparison of the relative risk associated with different enterprises. The CV is defined as the standard deviation of returns above variable cost for a particular enterprise divided by the average returns above variable cost for the enterprise (Steel). With exception of the harvesting and marketing cost which are adjusted for yield, real variable cost for the years of 1980 to 1983 will be assumed to be constant and equal to the 1985 input cost from the enterprise budgets developed for the first objective. Yield data for variety trials held at the OSU Research Station at Bixby is used and assumed to be proportional to the yield the farmers might be able to obtain in the study area (Motes, 1981, 1982, 1983, 1984). The average harvest season prices at the Dallas wholesale market can be multiplied by the yield to calculate total returns for each of the four years.

Existing nonvegetable enterprise budgets developed at Oklahoma State University can be converted from monthly time intervals to weekly intervals (Dept. of Ag. Econ., 1984). These budgets combined with vegetable enterprise budgets are used to develop a linear programming model of a representative farm in the study area. The model will generate optimal enterprise combinations given different management risk objectives.

Output from the model will indicate conditions under which vegetable enterprises supplement conventional activities in Atoka and Bryan counties. Optimal product-mix changes listed in the output can be interpreted to determine the solution's sensitivity to changes in input or output prices.

CHAPTER II

THEORY AND LITERATURE REVIEW

Theory

Farm managers make choices between numerous alternatives. Perhaps the most fundamental decision is what to produce. The enterprise decision is based on the goals and objectives of the farm manager. The objectives could be to maximize short run profits, maximize the chance for long run survival, maximize leisure while guaranteeing suitable profits as well as numerous other alternative objectives.

Economists use production economics, a subset of microeconomic theory to analyze production alternatives. Production economics is an applied field of science where the principles of choice are applied to the use of capital, labor, land, and management (Heady, 1952). Production economics deals with three types of problems (1) factor-factor when the decision is which input to employ, (2) factor-product concerns the allocation of one input to more than one output and (3) product-product when the decision is what enterprise or enterprises to produce. This study applies budgeting and linear programming methods to solve these problems.

Budgeting Procedures

Enterprise budgeting is a systematic method of developing a statement of what is generally expected by using particular production practices when producing a specified quantity of product. It uses economic theory, farm records and expectations (Casey, Jobes, and Walker 1977). Enterprise budgets are combined and used for whole-farm planning. Jobes (p. 139.2, 1984) lists six steps in the budgeting procedure:

1. Appraisal of the goals and objectives of the farm firm.
2. Inventory of the farm resources available.
3. Selection of physical data to be used in the production process.
4. Selection of enterprises to be budgeted.
5. Selection of prices to apply to physical data.
6. Calculation of expected cost and returns.

Although budgets alone are useful tools, limitations occur when inferences are drawn from one budget to a farm firm having different resources. Also, budgets are based on predictions of output and input prices which limit the budget's reliability. A small change in a price could significantly change the profitability of a whole farm plan.

Linear Programming Theory

Three components of a linear programming (LP) model are: an objective function, resource constraints and enterprises that require various combinations of the resources. A LP model maximizes or minimizes an objective function by using specified enterprises subject to pre-determined resource constraints. The general form of a linear programming model used for a maximization problem may be written as:

$$\text{maximize } Z = C_1X_1+C_2X_2 +\ldots+C_nX_n \qquad (2.4)$$

subject to the input-output relationships and the levels of available resources:

$$a_{11}X_1 + a_{12}X_2 + \ldots + a_{1n}X_n \leq b_1$$
$$a_{21}X_1 + a_{22}X_2 + \ldots + a_{2n}X_n \leq b_2$$
$$\vdots$$
$$a_{m1}X_1 + a_{m2}X_2 + \ldots + a_{mn}X_n \leq b_m \qquad (2.5)$$
$$X_1 \geq 0, X_2 \geq 0, \ldots\ldots, X_n \geq 0 \qquad (2.6)$$

where

Z = the objective function

C_j = net per unit returns associated with the activities

X_j = the possible alternative enterprises

a_{ij} = the requirements of resource i per unit of activity j,and

b_i = denotes the resource availabilities of the m resources

For a model with numerous restrictive resources and many alternative enterprises, LP is a tool that usually provides a more efficient solution than budgeting techniques.

A linear programming model in the purest form is valid only if the following assumptions are made:

1. Additivity of resources and activities. This assumption prohibits multiplicity interaction among the resources.
2. Linearity of the objective function. Product prices cannot be a function of the quantities sold (constant MPP).
3. Nonegativity of decision variables. It is not feasible to use negative amounts of inputs or produce a negative quantity of production.
4. Divisibility of activities and resources. Resources and activities can be used in fractional quantities.

5. Finiteness of activities and resource restrictions. There must be a finite number of alternative activities and resource constraints so that the problem is programmable and an optimal solution can be achieved.
6. Proportionality of activity levels to resources. A linear relationship between activities and resources is implied. Degree one homogenous production functions are assumed.
7. Single valued expectations. Perfect competition is assumed, therefore, input-output coefficients and input-output prices are known with certainty (Agrawal and Heady, 1972). The assumption prohibits variance or risk differences between activities.

The LP model can be modified to relax the assumptions. Parametric programming, integer programming and nonlinear programming extends the usefulness of the programming model. Resource constraints can be predetermined and easily modified to accurately reflect farm specifications.

LP is commonly used to select the optimal enterprises for specific farm organizations. A production possibilities curve is approximated as the model defines all possible combinations of enterprises that can be produced given the predetermined resource restrictions. The model then chooses the optimal solution based on the activity levels in the objective function.

Literature Review

There have not been specific economic studies of determining the feasibility of vegetable production in Atoka and Bryan counties.

However, there have been similar studies in other areas of the country and studies suggesting the potential of high value crops in southeast Oklahoma. A literature review reveals the need for a detailed study of the potential of implementing high value crops into the existing farm operation.

The major objective of a study by Salant and Marten (1980) was to determine whether a partial substitution of vegetables for field crops could increase net farm income to farmers in Southeast Arizona. This study focused on both the feasibility of production and the availability of markets. To accomplish their objectives, a LP model was developed using resource restrictions of a 200 acre representative farm. They formulated two alternative farm plans, one with and the other without vegetable enterprises. The study concluded that the farm organization with vegetable enterprises would be more profitable in a normal year. The study, although mentioning the fallacies of a model that does not include a measure of production risk, stated there was not enough historical data to measure the risk.

Ahmad (1980) used linear programming to determine optimal crop combination plans for small farmers in Eastern Maryland. He considered two management levels, high risk which included no restrictions on acreage for crops found suitable for a specific land type, and low risk which included a maximum restriction of 50 percent of the cropland for riskier crops. He classified the crops into high risk and low risk based on variation of yield, prices or gross revenues over time. Crop plans for four different size farms and three types of land were developed. The study concluded that small farmers with very little capital, poor land and only family labor will find it profitable to grow soybeans and watermelons.

In a study of vegetable farms in Delaware, Elterich and Lubech (1984) used minimization of total absolute deviations (MOTAD) to determine risk optimal organizations. In a predominantly fresh vegetable growing area, the authors suggested increasing production of less risky alternatives such as field corn and soybeans would be beneficial to many farm operators. Four farm sizes were considered ranging from 25 to 1,000 acres. For each farm the authors used LP to select the enterprise(s) that would maximize gross margins. They then assumed a specified gross margin and used MOTAD to choose the preferred level of risk. They found that specialization of crops allowed for higher gross margins, but are accompanied by higher risk values. Regardless of the farm size and risk level, vegetables dominated the grain crops of field corn and soybeans, although the percentage of soybean acreage varied inversely with the level of risk.

Comer and Woodworth (1976) used a case study farm in South Central Tennessee to illustrate the potential for increasing the income of limited resource farms. They suggested that one of the easiest methods of increasing income is to more efficiently use available land, labor, and capital. The authors developed a LP model to represent the case study farm. They compared one-man and two-men operations with 8,000 and 12,000 dollars of operating capital. For alternative enterprises, corn, milo, soybeans, bell peppers, tobacco, hay, cow-calf, feeder pigs, and market hogs were considered. The results indicated that incomes can be increased by using enterprises that better use the available resources. When there is an abundance of labor (two-men on 170 acres) labor intensive crops will increase income. When there was an abundance of capital ($12,000), capital intensive crops increase income.

Tweeten (1982) investigated the potential opportunities and constraints of the horticultural industry in the state of Oklahoma. He estimated the potential vegetable acreage in the year 1990 to be 51,750 compared to 31,350 in 1981. Oklahoma is becoming competitive with traditional production areas because of increased cost of energy, transportation and irrigation in those areas. Increased vegetable production is constrained by the labor intensiveness of many fresh vegetable crops, undeveloped marketing channels, extreme climatic conditions, and a shortage of research. The study concluded that the potential for profitable vegetable production in Oklahoma has never been greater.

CHAPTER III

DEVELOPMENT OF ENTERPRISE BUDGETS AND LINEAR PROGRAMMING MODEL

Enterprise budgets

To accomplish the first objective, enterprise budgets for selected vegetable enterprises are developed with weekly intervals of the resource requirements. Budgets are developed only for the vegetable crops for which Oklahoma yield data are available. Budgeting helps the farm decision maker determine the costs and returns associated with specific enterprises. Although each enterprise uses different combinations of inputs, the basis for each budget are similar so that cost and returns can be compared. The factors of production are separated and used as coefficients in the LP tableau. The budgets are developed with the Oklahoma State University Enterprise Budget Generator (Kletke 1979) and are shown in the Appendix.

Seventeen budgets are developed for this study including three agronomic crops, a cow-calf on pasture budget, and thirteen vegetable budgets. Each budget is broken into variable cost (operating cost), fixed cost and expected revenues. The budgets are developed for the climatic and soil conditions of Atoka and Bryan counties. These budgets are:

(1) Cow-calf on Bermuda and Fescue pasture;

(2) Hard-red winter wheat with custom harvesting;

(3) Dryland Peanuts with custom harvesting;

(4) Dryland Grain sorghum with custom harvesting;

(5) Spring broccoli (seeded) for fresh market;

(6) Spring broccoli (transplanted) for fresh market;

(7) Fall broccoli (seeded) for fresh market;

(8) Fall broccoli (transplanted) for fresh market;

(9) Watermelons for fresh market;

(10) Okra for fresh market;

(11) Bell Peppers for fresh market;

(12) Cantaloupes (muskmelons) for fresh market;

(13) Snap Beans for fresh market;

(14) Cucumbers for fresh market;

(15) Sweet Corn for fresh market;

(16) Sweet Potatoes for fresh market; and

(17) Staked Tomatoes for fresh market.

Although each crop budget is specific in planting and harvesting dates, in reality the planting activity can usually take place earlier or later without significantly changing the yield. To accommodate a flexible planting season, budgets are generated for each crop with all of the input requirements moved back and forward in one week intervals based on the growing season of each crop. Altering the planting dates also changes the harvesting schedule. Table II shows the planting dates and the corresponding range of harvesting dates for each crop. For this study it is assumed that the yields will remain constant regardless of the planting date the model chooses.

TABLE II

PLANTING AND HARVEST RANGE FOR SELECTED VEGETABLE ENTERPRISES

Crop	Planting Range	Harvest Range
Bell Pepper	Apr 2 - Apr 29	June 11 - Aug 26
Spring Broccoli (seeded)	Feb 19 - Mar 18	May 7 - June 17
Spring Broccoli (transplanted)	Mar 5 - Apr 1	Apr 30 - May 20
Fall Broccoli (seeded)	Aug 13 - Sep 16	Oct 15 - Dec 2
Fall Broccoli (transplanted)	Sep 3 - Sep 30	Oct 8 - Nov 20
Cantaloupe	Apr 2 - June 30	July 9 - Oct 21
Cucumber	Apr 2 - July 29	June 4 - Oct 28
Okra	Apr 9 - June 3	June 11 - Oct 28
Snap Bean	Mar 26 - May 13	May 28 - July 22
Sweet Corn	Mar 12 - May 13	June 4 - Aug 5
Sweet Potato	Apr 30 - June 17	Sep 10 - Oct 28
Tomato	Apr 2 - Apr 29	June 16 - Aug 19
Watermelon	Apr 2 - June 10	July 16 - Sep 23

Resource Base of Representative Farm

Physical resources are combined to produce agricultural products. Some resources are needed to produce a particular enterprise and are required only if that enterprise is produced. The price and quantities of these "variable" resources greatly influence the farm manager's enterprise choice decision. Other resources are assumed fixed to the operation because in the short run they are required independently of which enterprises are produced. The fixed inputs must be specified to define the scope of the enterprise alternatives from which to choose. For instance, if one has a source of surface water (fixed input), then catfish farming is an enterprise alternative that may be considered, but without surface water, catfish farming is not a possible alternative in the short run.

Fixed Inputs

The average farming operation in Atoka and Bryan counties is 350 acres - 32 percent cropland and 68 percent pasture and woodland. The hypothetical representative farm for this study consists of 320 acres (1/2 section) with 100 tillable acres and 220 acres of improved pasture.

The cow-calf operation and pasture maintenance are handled as one enterprise activity: cow-calf on pasture. The budget includes the maintenance cost of improved pasture on a per cow basis (a stocking rate of 2.20 acres per cow is assumed). The improved pasture consists of 66 percent common bermuda grass for warm season grazing and 34 percent fescue grass for cool season grazing. Each acre produces approximately 5 animal unit months of available forage. Heavy forage production requires intensive pasture management practices including weed control and fertilization. The pasture is the primary source of dry matter to meet the daily nutritional requirements of a mixed English breed beef cow herd.

The 100 acres of cropland ranges from nearly level to gently sloping with adequate drainage characteristics. The sandy-loam topsoil has a minimum depth of 24 inches. The land is assumed average in nutrient reserves for the area.

The hypothetical farm is managed by a full-time owner-operator. His labor is fixed to the operation but variable to the alternative enterprises. The time the operator is able to allocate to the productive aspects of the farm is dependent upon the climatic conditions of the area. In the winter months shorter and colder days limit the outside work. Therefore, it is necessary to reflect the climatic variation in the available working hours of the farm manager. Table III lists the weekly upper restraints of the farm managers time.

Implementing vegetable production into existing agronomic crop farm plans require very little specialized machinery provided the farm operator hand harvests the vegetables. A small two-row transplanter is the only specialized machine needed for small acreages of vegetable production. The remainder of the machinery and equipment is standard equipment for most agronomic farms. The technical coefficients used to determine the fixed and variable cost of operation for each piece of equipment is listed in the Appendix. Each of the implements can either be pulled with a 25 horse power tractor or a 40 horse power tractor (Table IV).

TABLE III

WEEKLY OPERATOR LABOR AVAILABILITY

Week	Hours	Week	Hours
1/1-7	30	7/2-8	60
1/8-14	30	7/9-15	60
1/15-21	30	7/16-22	60
1/22-28	30	7/23-29	60
1/29-2/4	40	7/30-8/5	60
2/5-11	40	8/6-12	60
2/12-18	40	8/13-19	60
2/19-25	40	8/20-26	60
2/26-3/4	40	8/27-9/2	55
3/5-11	50	9/3-9	55
3/12-18	50	9/10-16	55
3/19-25	50	9/17-23	55
3/26-4/1	50	9/24-30	55
4/2-8	55	10/1-7	50
4/9-15	55	10/8-14	50
4/16-22	55	10/15-21	45
4/23-29	55	10/22-28	45
4/30-5/6	55	10/29-11/4	40
5/7-13	55	11/5-11	40
5/14-20	55	11/12-18	35
5/21-27	55	11/19-25	35
5/28-6/3	55	11/26-12/2	35
6/4-10	55	12/3-9	30
6/11-17	60	12/10-16	30
6/18-24	60	12/17-23	30
6/25-7/1	60	12/24-31	35

Variable Inputs

Family labor, other than the operator labor, is assumed to be equivalent to hired labor. It is treated as a single activity and is included in the hired labor purchasing activity. Hired labor is assumed to be available in unlimited quantities at a price of 3.75 dollars per hour. The effects of enterprise decisions when the price of labor increases to 5.00 dollars per hour will be analyzed. This study assumes perfect mobility of the labor force.

Operating capital can be purchased at an annual rate of fifteen percent. Capital is assumed available up to 100 dollars per acre (32,000 dollars). The operating capital for each enterprise is computed from the beginning of land preparation until the output is sold. Operating capital is available in multiples of four week periods beginning the first week.

Cultivars (varieties) need to be chosen that are adaptable to the climatic conditions of Southeast Oklahoma. Without adaptable varieties, successful production would be practically impossible. Recommendations are a result of variety test trials located across the state (Motes). For some crops, purchased seedlings are recommended for the following reasons: (1) establishing a plant population; (2) adjusting to the growing season and (3) reaching a market at a desirable time. Seed and transplant prices used in the study are listed in Table V. Transplants are shipped in from other states and the prices reflect transportation costs. The seeds are planted with a 2-row planter on raised beds. The transplants are also planted on raised beds with a 2-row transplanter.

Fertilization is just one of the important cultural practices in

TABLE IV

EQUIPMENT COMPLEMENT AND TRACTOR REQUIREMENTS FOR THE HYPOTHETICAL FARM

	Tractor Size
Barrel Sprayer	25 HP
Boom Sprayer	25 HP
Cultivator Bedder Planter	25 HP
Disk	40 HP
Drill	25 HP
Lister	40 HP
Hand Rototiller	-----
Spike Harrow	25 HP
Transplanter	25 HP
2-Row Cultivator	40 HP
3-Pt. Plow 2 x 14	40 HP
4-Wheel Trailer	25 HP

TABLE V

INPUT PRICES: SEEDS AND TRANSPLANTS

Crop	Quantity	Units	Cost/Acre	Type[1]
Watermelon	1.5	lbs.	9.00	S
Broccoli	1.0	lbs.	200.00	S
Snap Bean	1.4	lbs.	112.00	S
Cucumber	1.5	lbs.	21.00	S
Okra	2.0	lbs.	2.50	S
Sweet Corn	10.00	lbs.	30.00	S
Tomato	5.0	THPL	250.00	T
Sweet Potato	13.00	THPL	260.00	T
Cantaloupe	2.0	lbs.	12.00	S
Bell Pepper	12.00	THPL	480.00	T
Broccoli	14.5	THPL	435.00	T
Peanut	70.	lbs.	49.00	S
Wheat	1.5	bu.	6.45	S
Grain Sorghum	5.	lbs.	3.75	S

[1] S = Seed, T = Transplants

the profitable production of vegetable crops. Fertilizer recommendations are derived with data from fertilizer studies across the state (Campbell). A commercially mixed fertilizer composed of 15 percent actual nitrogen (N), 15 percent phosphate (P_2O_5), and 15 percent potash (K_2O) is used for this study. The 15-15-15 fertilizer mix works well in Southeastern Oklahoma for most vegetable crops. When additional applications of nitrogen are needed, ammonium nitrate (34-0-0) is used. The fertilizer prices are quoted delivered to the farm gate (Table VI). The farm manager rents a fertilizer spreader on a per acre basis and pulls the spreader with the 25 horse power tractor. The actual amount of fertilizer that any producer uses should be based on a soil fertility test.

Herbicides, insecticides, fungicides, nematacides, and bacteriacides are necessary for consistent production of high quality vegetables. The requirements differ from year to year due to fluctuations of insect population, soil conditions, climatic factors, and the particular crop. Recommendations for specific chemical types and the volumes are average yearly requirements. The chemicals are priced delivered and according to the amount of active ingredient in the chemical mixture (Table VII). Specific trade and/or brand names of chemicals are listed only for budgetary and information purposes. The local Cooperative Extension Service agent should be consulted for current recommendations concerning chemicals for specific problems. Herbicides should never be applied in the same applicator as other chemicals because any residual herbicide left in the applicator could harm other crops during future spraying. For this study, a barrel sprayer is reserved for herbicide application and the other chemicals

TABLE VI

INPUT PRICES: FERTILIZER AND SPREADER

Fertilizer	Price	Unit
15-15-15	$9.75	cwt.
Nitrogen	.33	lb.
Phosphorous	.25	lb.
Potassium	.13	lb.
Rent Spreader	1.25	acre

TABLE VII

INPUT PRICES: CHEMICALS

Name	Price	Lbs. (a.i.)	Type[1]
Treflan 4E	$ 3.75	.5	H
PYDRIN 2.4E	12.00	.15	I
Manzate 200	6.50	1.5	F
Kocide 101	7.50	3.0	B
Sevin 4F	5.00	1.0	I
Sonalan	7.50	.75	H
LASSO	12.00	3.0	0
Lannate	4.00	.625	I
BRAUD	12.40	1.5	F
MOCAP	1.10	4.0	N
ENIDE	45.00	5.0	H
Parathion	4.00	.5	I

[1] H = Herbicide, I = Insecticide, B = Bacteriacide, F = Fungicide, N = Nematacide.

are applied with a three point boom sprayer.

Grading and marketing cost are developed for each vegetable budget. These cost includes all processing, packing and transportation from the time the harvested vegetables are placed on a 4-wheel trailer until they are delivered to the Dallas Wholesale Market. The grading cost are necessary as most of the vegetables are not marketable in their harvested form. Many need to be cooled, cleaned, waxed, graded and packaged before they can be sold. Each type of vegetable requires specific pre-marketing processing therefore each has different costs. The grading, packing, cooling equipment, and packout rate were determined from "Planning Data for Marketing Fruits and Vegetables in the South" (Brooker and Pearson, 1970). They determined the input-output coefficients by observing packing facilities and by an economic-engineering method using manufacturers' recommended capacities of packing equipment. The price of the inputs such as electricity and labor were updated to reflect 1985 costs (Dickey, 1985). The marketing and grading cost are listed in Table VIII.

Product Prices

Although there isn't an easily observable yearly price trend of the vegetable crops, there is considerable price variation within the season for many crops. Therefore, prices should not be assumed constant throughout the harvest season. Product prices for the vegetable enterprises are determined from six years of weekly historical data at the Dallas wholesale market. The price paid to the growers for vegetables is equal to the Dallas Wholesale price minus a standard 15 percent brokerage fee (adjusted Dallas Wholesale Price). The vegetable

TABLE VIII

MARKETING COST FOR SELECTED VEGETABLE ENTERPRISES

Crop	Lbs.	Container Type	Mkt/Grad/Haul[1]
Broccoli	22	crate	$1.33
Cantaloupe	38	crate	.94
Okra	18	carton	1.58
Tomato	30	lug	.75
Bell Pepper	30	carton	.76
Cucumber	40	carton	1.00
Sweet Corn	45	crate	.51
Sweet Potato	40	bushel	.66
Snap Bean	30	crate	.83
Watermelon	100	1/7 bin	.89

[1] Does not include container cost

price at the farm gate is equal to the Dallas Wholesale Market price minus the marketing and grading cost. Determining prices for this study is a two-step process. First, the weeks in which harvest could occur is determined. Then, the six year average price for each week is calculated. This price is then converted to the adjusted wholesale market price and used in the analysis. Table IX lists the product prices used in the linear programming model and for generation of the budgets.

Prices for the nonvegetable enterprises are expectations developed from discussions with OSU extension personnel and from extension publications (Dept. of Agr. Econ., 1985). The prices are estimations of what the prices will be on the preselected selling dates. No storage cost are added as it is assumed the farm manager sells the crop at a local cash market during harvest. The prices are assumed to be quoted at the farm gate.

Costs

Labor accounts for a major portion of the costs of agricultural enterprises. Table X summarizes the hourly requirement, and the percentage of the total operating cost for each enterprise ranked from highest to lowest.

Total harvesting cost includes the cost of actual harvesting, grading, marketing, hauling, and shipping containers. For the traditional crops (peanuts, grain sorghum, wheat) custom harvesting is assumed because there is not enough acres to pay for expensive specialized harvesting equipment. For vegetable crops, harvesting cost is a major input cost. Table XI shows the percentage of total cost that

TABLE IX

AVERAGE WEEKLY PRODUCT PRICES FOR SELECTED VEGETABLE ENTERPRISES

Date	Bell Peppers	Broccoli (Fall)	Broccoli (Spring)	Canta- loupe	Cucumber	Okra	Snap Beans	Sweet Corn	Sweet Potatoes	Tomatoes	Watermelon
4/16 - 22											
4/23 - 29			7.76								
4/30 - 5/6			7.40								
5/7 - 13			7.40								
5/14 - 20			7.01								
5/21 - 27			6.65								
5/28 - 6/3			6.85				10.04				
6/4 - 10			7.29		9.56		9.48	6.16			
6/11 - 17	10.29		7.46		10.12	5.88	9.60	6.77			
6/18 - 24	10.38				9.10	5.92	10.41	7.62		9.44	
6/25 - 7/1	10.72				9.38	5.95	10.16	8.01		8.86	
7/2 - 8	11.32				9.32	5.77	9.89	8.08		8.60	
7/9 - 15	9.97			7.46	9.30	5.95	10.38	7.39		7.16	
7/16 - 22	9.77			6.89	10.17	6.09	10.40	7.34		6.49	5.53
7/23 - 29	9.44			6.43	8.61	5.88		6.57		7.31	5.38
7/30 - 8/5	9.93			6.60	7.79	5.59		6.32		7.30	4.74
8/6 - 12	9.74			6.61	7.68	4.73				6.59	4.89
8/13 - 19	9.41			6.55	6.98	5.09				6.50	4.57
8/20 - 26	8.25			6.04	6.70	4.92					3.97
8/27 - 9/2				6.32	7.08	4.71					3.68
9/3 - 9				6.67	8.53	4.85					3.68
9/10 - 16				6.70	8.20	4.79			8.50		3.76
9/17 - 23				6.87	8.19	4.96			8.36		3.89
9/24 - 30				6.89	8.36	5.21			8.11		
10/1 - 7				6.90	9.32	5.17			7.83		
10/8 - 14				7.28	8.64	5.46			7.74		
10/15 - 21		7.08		7.33	8.02	5.53			7.52		
10/22 - 28		7.24			7.85	5.56			7.49		
10/29 - 11/4		6.96			7.35						
11/5 - 11		6.91									
11/12 - 18		7.26									
11/19 - 25		6.64									
11/26 - 12/2		6.49									
Average	9.80	8.22	7.23	6.77	8.46	5.42	10.07	7.17	7.94	7.53	4.43

TABLE X

PER ACRE LABOR REQUIREMENTS OF ENTERPRISES USED IN STUDY

Crop	Hours	Percent of Total Cost[1]
Okra	343.0	56
Snap Bean	121.1	50
Tomato	483.6	48
Watermelon	63.2	44
Cucumber	121.8	35
Sweet Potato	147.0	34
Bell Pepper	194.9	33
Cantaloupe	127.0	32
Broccoli (seeded)	128.0	27
Broccoli (transplanted)	136.3	26
Sweet Corn	34.4	18
Grain Sorghum	4.1	17
Peanut	7.6	15
Wheat	2.2	10

[1] Assumes 3.75 dollar labor.

TABLE XI

PER ACRE COST OF HARVEST FOR SELECTED VEGETABLE ENTERPRISES

Crop	Carton Cost	Labor Cost	Marketing Cost	Total Production Cost	Total Harvest Cost	Percent Harvest Cost
Spring Broccoli (Seeded)	$382.50	$375.00	$498.75	$1762.47	$1256.25	%71.29
Watermelon		120.00	124.60[1]	552.24	244.60	44.29
Bell Pepper	306.00	506.25	228.00	2220.82	1040.25	46.84
Okra	510.00	1125.00	290.00	2303.02	1925.00	83.59
Cucumber	306.00	337.50	300.00	1297.66	943.50	72.71
Snap Bean	122.50	375.00	99.60	916.57	597.10	65.15
Fall Broccoli (Seeded)	408.00	450.00	532.00	1869.56	1390.00	74.36
Spring Broccoli (TRPL)	357.00	375.00	465.50	1962.92	1197.50	61.00
Cantaloupe	306.00	375.00	498.00	1159.50	865.00	74.60
Sweet Potato	306.00	337.50	198.00	1611.65	841.50	52.21
Fall Broccoli (TRPL)	357.00	375.00	465.50	1928.68	1197.50	62.09
Tomato	420.00	750.00	525.00	3743.32	1695.00	45.28
Sweet Corn	183.60	30.00	91.80	724.18	305.40	42.17

[1] Includes Carton.

is attributed to harvesting.

Returns

Net returns of farm enterprises are a function of the prices and quantities of inputs and outputs and the timing of purchases and sales. Return above operating costs (net returns) is equal to the total revenue (yield multiplied by price) minus total variable cost (summation of operating cost). Comparing returns above operating cost of the different enterprises points out the expected profitability of many of the vegetable crops. Returns above operating cost based on season average output prices are summarized in Table XII and ranked from the largest to the smallest. Although some of the crops are much more profitable than others, one should not be misled. How each crop fits into the whole farm plan should be considered.

Net Returns Risk

Lipton (1968) argued that farmers may choose less risky crops even if they are less profitable. According to this interpretation if farmers are assumed to be utility maximizers, allowances must be made for some tradeoffs between variance (as a measure of risk) and expected profit. To develop a measurement of relative risk for each vegetable enterprise, the coefficient of variation (CV) is calculated. The CV is a unitless measure of the variation of price, yield, and input cost as it affects net returns. For this study, the input costs except harvest cost are assumed constant over the period of 1980 to 1983. The harvest cost has a linear relationship with the yield. The total cost is calculated by adding all preharvest cost to the expected harvesting cost

TABLE XII

RETURNS ABOVE TOTAL OPERATING COST OF ENTERPRISES USED IN STUDY

Crop	Planting Week	Units	Returns
Tomato	4/2 - 8	acre	$1527.68
Cucumber	4/9 -15	acre	1240.34
Spring Broccoli (seeded)	2/26-3/4	acre	948.78
Fall Broccoli (seeded)	8/27-9/2	acre	926.44
Sweet Potato	5/14-20	acre	770.35
Bell Pepper	4/16-22	acre	719.18
Fall Broccoli (transplanted)	9/10-16	acre	692.57
Spring Broccoli (transplanted)	3/12-18	acre	567.22
Sweet Corn	3/26-4/1	acre	566.42
Cantaloupe	4/16-22	acre	533.00
Okra	4/23-29	acre	406.97
Snap Bean	4/9 -15	acre	291.83
Peanut (Quota)	5/14-20	acre	194.63
Watermelon	4/9 -15	acre	67.96
Wheat	9/17-23	acre	21.17
Beef Cow		head	23.07
Grain Sorghum	5/14-20	acre	12.06

associated with the yield. Table XIII is an example of how the CV is calculated. It is assumed that there is equal risk associated with input cost and availability. Table XIV presents the CV for each vegetable enterprise where the largest value is representative of higher levels of risk associated with the crop.

The mean CV and standard deviation are also presented in Table XIV. Each crop is then classified as low risk, medium risk, or high risk depending on their position relative to the mean. Any CV that is greater than one standard deviation over the mean is classified as high risk, crops over one standard deviation below the mean are considered low risk.

The Linear Programming Model

A linear programming model is designed to achieve the final two objectives of the study. The model is developed to maximize net returns given the resource restrictions of different farm scenarios.

A matrix of approximately 550 rows and 500 columns, depending on the scenario, is developed to determine the optimal product mix. The rows consist of all of the inputs that are constrained in the study and transfer rows. Each row is an equation where the combined total of the resource levels used in a farm mix must be either "equal to," "less than" or "greater than" the restraint imposed, depending upon the type of restraint. For example, it is assumed that there are 100 acres of cropland, so the cropland rows are set up so the producer can only have "less than" or "equal to" 100 acres of crops in any given week.

The columns consist of all of the production activities (okra, wheat, etc.), borrowing cash, hiring labor, selling production, and cash

TABLE XIII

EXAMPLE OF THE CALCULATION OF THE COEFFICIENT OF VARIATION

Crop	Watermelons				
Year	Yield[1]	Price[2]	Total Revenue	Total[3] Cost	Return above Cost
1980	465	4.85	2255.25	1119.99	1135.26
1981	331	5.48	1813.88	885.90	927.98
1982	729	4.89	3564.81	1581.20	1983.61
1983	585	5.65	3305.25	1329.64	1975.61

$$CV = \frac{\text{Standard Deviation of Returns above costs}}{\text{Average Returns above costs}} = \frac{553.835}{1505.615} = .3826$$

[1]Yields cwt. per acre based on trial studies in Bixby, Oklahoma for Charleston Gray 133 watermelons

[2]Prices are average cwt. seasonal price from Dallas Wholesale Market

[3]Total cost in dollars/acre are calculated using the formula preharvest cost (307.64) plus the harvesting cost (1.747 * yield).

TABLE XIV

COEFFICIENT OF VARIATION OF SELECTED VEGETABLE CROPS

Crop	CV	Risk Rating[1]
Spring Broccoli	.75	H
Cucumber	.67	H
Tomato	.56	M
Bell Pepper	.48	M
Sweet Corn	.40	M
Watermelon	.37	M
Snap Bean	.37	M
Sweet Potato	.30	M
Cantaloupe	.30	M
Fall Broccoli	.26	M
Okra	.16	L
Mean	.42	
Standard Deviation	.18	

[1] H = High, M = Medium, L = Low

flow transfer activities. Each parameter in the columns represent how many units of the row resource is required for the particular column activity. A portion of the linear programming tableau with sweet corn and quota peanuts as the only crop production activities is presented in Table XV. The partial tableau provides a picture of the LP without all the details. There is a crop production activity for each planting week for each crop plus a cow-calf on pasture activity. There is a yield row for each harvesting week for each crop and for cull cows, steer and heifer production. There are land, labor, and cash flow for each week. There are hired labor and water buy activities for each week. There are selling activities for all items of production for each week of the harvesting season. Cash flow transfer activities transfer positive cash flows from one week to the next. Borrowing activities allows operating capital to be borrowed, then paid back with interest.

The first three columns of the tableau shown in Table XV represent the production of one acre of peanuts. Actually, five activities are in the model, one for planting each week from week 20 through week 24. The objective value for the activity contains the variable cost, except for labor and operating capital costs, of producing one acre of quota peanuts. The cash flow row coefficient for each week contains the value of variable cost, except labor and operating capital cost, that occurs during that week. If no input is used for the week, the cash flow row coefficient is zero for the week. The yield row for quota peanuts contains minus the yield of peanuts. There is only one yield row for quota peanuts and the other nonvegetable crops since it is assumed they are only harvested in one week regardless of when planted. The labor row for each week contains the amount of labor used in the production

ROW NAMES	Plant Quota Peanuts Week 20	...	Plant Quota Peanuts Week 24	Plant Sweet Corn Week 11	...	Plant Sweet Corn Week 19	Hire Labor Week 1	...	Hire Labor Week 52	Sell Quota Peanuts Week 42
Objective	b	b	b	b	b	b	-3.75	-3.75	-3.75	22
Cash Flow Week 1	a	a	a	a	a	a	3.75			
Cash Flow Week 2	a	a	a	a	a	a		e		
Cash Flow Week 3	a	a	a	a	a	a		e		
Cash Flow Week 4	a	a	a	a	a	a		e		
...	a	a	a	a	a	a		e		
Cash Flow Week 23	a	a	a	a	a	a		e		
...	a	a	a	a	a	a		e		
Cash Flow Week 31	a	a	a	a	a	a		e		
...	a	a	a	a	a	a		e		
Cash Flow Week 42	a	a	a	a	a	a		e		-22
...	a	a	a	a	a	a		e		
Cash Flow Week 49	a	a	a	a	a	a		e		
Cash Flow Week 50	a	a	a	a	a	a		e		
Cash Flow Week 51	a	a	a	a	a	a		e		
Cash Flow Week 52	a	a	a	a	a	a			3.75	
Capital Week 4										
Capital Week 8										
...										
Capital Week 48										
Capital Week 52										
Yield Quota Peanuts Week 42	-17	-17	-17							1
Yield Sweet Corn Week 23				-180						
...					-180					
Yield Sweet Corn Week 31						-180				
Labor Week 1	a	a	a	a	a	a	-1			
Labor Week 2	a	a	a	a	a	a		-c		
...	a	a	a	a	a	a		-c		
Labor Week 51	a	a	a	a	a	a		-c		
Labor Week 52	a	a	a	a	a	a			-1	
Quota Peanut Restriction	1	1	1							
Cropland Week 1										
...										
Cropland Week 11										
Cropland Week 12	1									
....	c	c	c							
Cropland Week 42	1	1	1							
Cropland Week 43										
...										
Cropland Week 52										
Vegetable Land Week 1										
...										
Vegetable Land Week 6										
Vegetable Land Week 7				1						
...				1	c	c				
Vegetable Land Week 23				1	1	1				
Vegetable Land WeeK 24					1	1				
...					c	c				
Vegetable Land WeeK 52										

a is a positive coefficient or zero.
b is a negative coefficient or zero.
c is a positive one or zero.
d is a negative one or positive one or zero.
e is 3.75 or zero.
... means activities (rows) have been left out for the weeks or combination of weeks between the two activities (rows).
Known zero coefficients have not been shown.

TABLE XV

A PARTIAL TABLEAU OF THE LINEAR PROGRAMMING MODEL

Sell Sweet Corn Week 23	...	Sell Sweet Corn Week 31	Transfer Cash Flow Week 1 to Week 2	...	Transfer Cash Flow Week 51 to Week 52	Borrow Cash Flow Week 1 Pay back Week4	...	Borrow Cash Flow Week 1 Pay back Week 52	...	Borrow Cash Flow Week 49 Pay Back Week 52	Row Type	Right Hand Side
6.16	a	6.32				.0115	b	-.15	b	-.0115		
			1			-1	-1	-1			L	0
			-1	d							L	0
				d							L	0
				d		1.0115					L	0
				d			a		a		L	0
-6.16				d			a		a		L	0
	b			d			a		a		L	0
		-6.32		d			a		a		L	0
				d			a		a		L	0
				d			a		a		L	0
				d			a		a		L	0
				d					a	-1	L	0
				d					a		L	0
				d	1				a		L	0
					-1			1.15	a	1.0115	L	0
						1	1	1			L	32000
							c	1	c		L	32000
							c	1	c		L	32000
							c	1	c		L	32000
								1	c	1	L	32000
											L	0
1											L	0
	1										L	0
		1									L	0
											L	30
											L	30
											L	a
											L	30
											L	35
											L	22
											L	80
											L	80
											L	80
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											L	20
											L	20

of one acre of quota peanuts during that week. The quota peanut restriction row contains a 1 and is used to restrict total quota peanut production to twenty-two acres. For planting week 20, the cropland rows for weeks 12 to 42 contain a 1 and the other weeks a zero.

The next three columns represent the nine sweet corn production activities. They are basically the same as the quota peanut activities except they yield sweet corn and use vegetable land. There is a sweet corn yield row for each week sweet corn can be harvested. The other vegetable production activities are basically the same as the sweet corn activities except some crops are harvested in multiple weeks.

The next seven columns represent the labor hiring activities and the product selling activities. The hire labor activities hire one hour of labor at a cost of $3.75 for a specific week. The labor row for the week hired has a -1 coefficient and the cash flow row for the week has a coefficient equal to the cost. The selling activities sell one unit of product from the specified week. The objective value coefficient for the selling activity contains the income received for one unit of the product sold that week. The price may be different for each week as shown previously in Table IX. The yield row for the specified week has a coefficient of 1, since it takes one unit of production to sell an unit. The cash flow row for the selling week contains a coefficient of minus the income since selling the item provides cash flow.

The next three columns represent the fifty-one cash flow transfer activities. These activities transfer excess cash flow from one week to the next without any cost or income. Cash flow cannot be transferred from the end of the year to the beginning of the year. The cash flow row coefficient for the week being transferred from is a 1 and the coefficient for the next week's cash flow is a -1.

The next five columns represent the ninety-one borrow operating capital activities. For borrowing purposes, the 52 weeks are broken into thirteen four weeks periods. Operating capital can be borrowed the first week of any period and must be paid back the last week of that period or any later period. The capital rows are used to put an upper limit on the amount of operating capital that can be borrowed at any one time. Capital rows are only needed for every fourth week since capital can only be borrowed one week in any four week period. The coefficient for the objective row for the borrowing activities is the cost of borrowing one dollar for the length of time specified by the activity. The cash flow row for the week the capital is borrowed has a -1 coefficient and a coefficient of 1 plus the interest for the week it is paid. All capital rows between the week the capital is borrowed and the week it is paid, including the week paid, have a coefficient of 1.

The last two columns specify the type of the row and the right hand side or resource availability for each row. All of the rows are of the less than or equal to type. The right hand side value for the capital rows is $32,000; for the cropland rows is 80 acres; for the vegetable land rows is 20 acres; for the labor rows is as was previously specified for each week in Table III; and for the quota peanut restriction is 22 acres for the example tableau in Table XV. The right hand side values may change as described below in the discussion of the scenarios.

Scenario Development

To fulfill the objectives, a representative farm is defined and resource restrictions are assumed. Four scenarios of the representative farm are developed by modifying the LP model. The first scenario is a typical farm with traditional enterprises alternatives. Computing the net returns of this whole farm plan is necessary to determine if farm incomes can be increased if vegetable enterprises are included. The second scenario is the same hypothetical farm, except the farm manager chooses to include vegetable enterprises on a limited number of acres. The manager in this scenario assumes the production and price risk of each vegetable crop is the same. The third scenario includes vegetable crops but allocates the acreage partially according to the net returns risk of each crop. The fourth scenario is developed like the second scenario except the vegetable output prices are lowered 15 percent. The final scenario used the same farm organization of the third scenario except the vegetable output prices are lowered 15 percent.

Scenario One

All existing farm operations differ according to size, management strategies, and objectives. Therefore, it is difficult to specify the "typical" farm organization. For the first scenario of this study, it is assumed the manager has his choice of raising the most common enterprises in the two counties. He has the resource base and management skills to produce wheat, grain sorghum, and/or peanuts as crop enterprises. Since cattle operations dominate the area, it will be assumed that the farm manager owns a cow-calf operation. The LP contains no vegetable activities.

The cow-calf operation consists of a maximum of 100 cows with a spring calving objective. An 86 percent weaning rate is assumed with an equal chance to wean heifers as bulls. One out of twelve cows are sold yearly and replaced with heifers produced within the operation. A two percent annual death rate of the cows is assumed and also replaced with heifers produced on the farm. All steer calves and the remaining heifer calves are sold at an average weight of 460 pounds and 430 pounds respectively. Each cow requires 12.2 animal unit months of pasture annually. To meet these requirements, 2.20 acres of bermuda-fescue pasture are allocated per cow. Cost of supplemental grass hay and protein cubes that are provided during December, January and February are included in the budget.

The manager is assumed to be indifferent as to which grain crop(s) to produce. His decision is based on the expected cost and returns of each enterprise and how the enterprise complements his cow-calf herd. The LP model will be used to determine which crop(s) to produce on the 100 acres of cropland.

Wheat, a winter crop, is planted during the fall of one year and is harvested in the early summer of the following year. This results in problems when using a planning horizon of one calendar year. If the model chooses to grow wheat, it will appear that the wheat is harvested before it is planted. To resolve the problem it is assumed that if wheat is harvested, next years wheat must be planted this year. To keep the model simple, no grazing of wheat is assumed. Stockers could probably be grazed but would have little influence on the solution since operator labor is in excess during the grazing period.

Peanut production and marketing is controlled by the 1981 farm act. Peanut growers are allotted a production quota which they can market at the government support price. If the grower chooses to produce more than his quota, he can sell the excess production on the open market and receive a lower price. For this study, it is assumed the grower has acquired a quota of 37,400 pounds which is the approximate average for all farms that received a quota in 1985 for the two counties. With an expected yield of 1700 pounds per acre, the producer can raise a maximum of 22 acres of government supported peanuts to reach his quota.

Grain sorghum and wheat are assumed to be under no government restrictions and are restricted only by the variable inputs as indicated on the budgets. A competitive market is assumed where the grower has no control of input or output prices.

Scenario Two

One underlying assumption of this study is that farmers are risk averse. One cannot expect an existing cow-calf and row-crop producer to discontinue all enterprises and produce only vegetables. Because of the relative newness of commercial vegetable production in the study area, vegetables must be considered as a supplemental source of farm income as farm managers cautiously divert acreage from agronomic production to horticultural production. They must also develop the management skills required for vegetable production. Therefore, for this study, only 20 acres will be assumed available for vegetable production. It is also assumed that the 20 acres will not be used for grain crop production.

Two hundred twenty acres of pastureland is assumed available for the cow-calf operation. Grain crop production can be grown on 80 acres, with a maximum of 22 acres of quota peanuts. The remaining 20 acres will be diverted to vegetable production. Vegetable activities and associated yield rows and selling activities are added to the LP tableau. Vegetable land rows are added with a upper restraint of 20 acres and the cropland restraint is changed to 80 acres.

Results from this scenario should help determine if vegetables can be profitably supplemented to the existing farm operation without changing the current product mix. For example, if the producer is basically a grain sorghum and cattle producer, this scenario should determine the effects of net farm income if he diverts some of his grain sorghum land to vegetable production.

Scenario Three

For the third scenario the vegetable crops will be constrained according to their risk classifictions as described under net returns risk above. Okra is the only low risk vegetable crop and will be forced into the farm operation at a minimum of 10 acres (50 percent of available land). Cucumbers and spring broccoli will be limited to a maximum of 5 acres combined as they are classified as high risk. The model will then choose whether to grow the high risk crops or use the five acres for other crops.

The cow-calf and row-crop enterprises will be held constant as in the second scenario. The purpose of this scenario is to determine which vegetable crops best fit into an existing operation if the producer considers the relative risk of the vegetable crops.

The LP model would be the same as in scenario two except two rows are added. The first one restricts cucumbers and spring broccoli to a maximum of 5 acres and the second one requires a minimum of 10 acres of ~~cucumbers~~ okra.

Scenario Four

Adding vegetables to the whole farm plan may or may not be risky. However, there is little question that the price uncertainty is extremely high, as very little price analysis has been done for vegetable crops in Southeastern Oklahoma. Whether the producer can receive the prices suggested in this study is unknown. It is difficult for producers to market at the Dallas Wholesale Market. The buyers at the market only purchase from established growers or packing organizations in which they have developed a considerable amount of trust. The wholesalers reputations are with every unit of vegetable delivered to food retailers. Breaking into the wholesale market is slow and, therefore, the grower must have other outlets for his production. This scenario attempts to deal with this problem by determining the effects on the whole farm plan when the output prices are fifteen percent lower than the wholesale prices assumed in scenario one.

The LP model for the fourth scenario is identical to the LP model of the second scenario with the exception of lowering the output prices of the vegetable enterprises by fifteen percent.

Scenario Five

The final scenario takes the farm organization developed in scenario three except the vegetable prices are fifteen percent lower than wholesale prices for the same reasons as in scenario four. The purpose of this scenario is to determine the effects of lower output prices when the producer is placing restrictions based on the CV.

CHAPTER IV

WHOLE FARM ANALYSIS

A matrix is built from budgets and data sets specifying the objective function, resource base, activity limits, and output prices. Then the Mathematical Programming Solutions Extended (MPSX) algorithm is used to maximize the objective function through linear programming (LP). Output from the LP is used to determine the profitability of including vegetable enterprises into hypothetical farm plans using both 3.75 and 5.00 dollars per hour hired labor.

Interpretation of MPSX Output for Scenario One

This scenario is defined as the base farm which will be used to help analyze the remaining scenarios. The base farm was restricted to 320 acres, 100 tillable and 220 improved pasture. It is assumed that the manager had a choice of producing any combination of grain sorghum, wheat, and peanuts on the tillable acreage. Peanuts sold at the government support price (quota peanuts) are restricted to a maximum of 22 acres. The 220 acres of improved pasture is used for the cow-calf operation. A stocking rate of 2.20 acres per cow is assumed resulting in a maximum of a 100 cow herd.

Result of Scenario IA

The objective function was specified to maximize returns above the operating cost. The returns above operating cost (value of the objective function) for the optimal solution is 14,792 dollars, an average of 46 dollars per acre. The enterprises and quantities of each that are included in the optimal farm plan are presented in Table XVI.

The results are predictable as quota peanuts which has the highest per acre return and is produced on 22 acres, the maximum allowed. Wheat is produced on the remaining 78 acres of cropland. The planting season of wheat is staggered over a period of three weeks.

Grain sorghum and non-quota peanuts are not in the optimal solution. For one acre of grain sorghum to enter the model, a 8.34 dollar penalty would be assessed to the objective value. Grain sorghum could enter the model if the net income from grain sorghum increased by 8.34 dollars or if net income of wheat decreased by 8.34 dollars per acre.

The cow-calf operation enters the solution at the maximum level of 100 cows. The shadow price of one unit of cow-calf operation is 53.77 dollars which suggest that if one cow-calf unit is forced out of the model, the objective value will decrease 53.77 dollars. The highest shadow price for each class of land is presented in Table XVII.

An interesting observation is that 1704 hours of unused operator labor is available, which indicates that the producer has more time available than necessary for traditional enterprises. There are only three weeks in which all of the operator labor is used. Presumably, with the excess labor, vegetables or other labor intensive enterprises can be viable alternatives that producers in Atoka and Bryan counties should consider.

TABLE XVI

SUMMARY OF INPUT AND OUTPUT LEVELS IN MPSX OPTIMAL SOLUTION FOR SCENARIO ONE

Row	Week Planted	Unit	Optimal enterprise combination	
			A[1]	B[2]
Objective Function		Dollars	14791.90	14683.99
Cow-Calf		head	100	100
Quota Peanut	May 28 - June 3	acres	22	22
Wheat	Sept 17 - 23	acres	6.98	6.98
Wheat	Oct 8 - Oct 14	acres	45.82	45.82
Wheat	Oct 15 - Oct 21	acres	25.20	25.20
Max Labor Hire		hours	81.70	81.70
Max Capital Borrow		dollars	13456.24	13556.07

[1] Hired labor charge of $3.75 dollars per hour

[2] Hired labor charge of $5.00 dollars per hour

TABLE XVII

SUMMARY OF MPSX MAXIMUM SHADOW PRICES FOR ROWS AT LIMIT LEVEL FOR ALL SCENARIOS

Row	Labor Charge $3.75/hour					Labor Charge $5.00/hour				
	I	II	III	IV	V	I	II	III	IV	V
Cow unit	53.77	51.51	50.31	51.61	46.71	51.76	47.19	41.89	45.04	43.33
Quota Peanut Constraint	290.37	269.99	268.74	273.58	265.17	290.37	269.71	256.30	267.71	271.59
Cropland	34.67	25.85	25.13	27.73	4.80	34.67	24.38	23.64	17.17	19.15
Vegetable land	---	666.08	709.32	502.45	311.58	---	722.18	773.73	496.97	415.15

Results of Scenario IB

For the same scenario but with 5.00 dollars an hour hired labor, the value of the objective function was 14,684 dollars or 46 dollars per acre. The optimal product mix remained identical to the 3.75 dollar per hour hired labor model.

Interpretation of MPSX Output for Scenario Two

The hypothetical farm for this scenario is based partially on the results of the first scenario. The optimal solution of the base farm included 22 acres of quota peanuts, 78 acres of wheat, and a 100 head cow herd. For this scenario, 20 acres was diverted from wheat production to vegetable production. The cow-calf operation is fixed at 100 head, and quota peanuts at 22 acres. The results are analyzed using 3.75 and 5.00 dollars per hour hired labor. The enterprises used in the optimal solutions are listed in Table XVIII.

Results of Scenario IIA

The value of the objective function for the model using 3.75 dollar per hour hired labor was 70,117 dollars, an average of 219 dollars per acre.

The optimal enterprise mix included transplanted spring broccoli, tomatoes, cucumbers, seeded fall broccoli and transplanted fall broccoli. Triple and double cropping of the land resulted in 40.64 acres of vegetables being produced on the 20 acres of vegetable land. The optimal farm mix included the following double and triple cropping systems:

TABLE XVIII

SUMMARY OF INPUT AND OUTPUT LEVELS IN MPSX OPTIMAL SOLUTION FOR SCENARIO TWO

Row	Week Planted	Unit	Optimal enterprise combination	
			A[1]	B[2]
Objective Function		Dollars	70117.36	64670.94
Cow-Calf		head	100	100
Quota Peanuts	May 14 - May 20	acres	4.48	--
Quota Peanuts	Apr 30 - May 6	acres	17.52	17.80
Quota Peanuts	May 21 - May 27	acres	---	4.20
Wheat	Sept 10 - 16	acres	13.55	32.04
Wheat	Oct 8 - Oct 14	acres	44.45	25.96
S. Broccoli (seeded)	Feb 26 - Mar 4	acres	---	.66
S. Broccoli (seeded)	Mar 5 - Mar 11	acres	---	.01
S. Broccoli (TRPL)	Mar 5 - Mar 11	acres	.92	.32
Tomatoes	Apr 2 - Apr 8	acres	2.43	.23
Cucumber	Apr 12 - Apr 8	acres	16.65	16.87
Cucumbers	Apr 23 - Apr 29	acres	---	1.91
Cucumber	June 11 - June 17	acres	.92	.32
Cucumber	Jul 16 - Jul 22	acres	---	.42
Cucumber	Jul 23 - Jul 29	acres	---	.25
F. Broccoli (seeded)	Aug 13 - Aug 19	acres	16.65	16.87
F. Broccoli (seeded)	Aug 20 - Aug 26	acres	2.43	1.51
F. Broccoli (seeded)	Sep 10 - Sep 16	acres	---	.63
F. Broccoli (TRPL)	Oct 8 - Oct 14	acres	.92	.32
Max Labor Hire	Oct 22 - Oct 28	hours	1215.70	1209.83
Max Capital Borrow	Jun 11 - Jun 17	dollars	18540.28	15846.76

[1] Hired labor charge of $3.75 dollars per hour

[2] Hired labor charge of $5.00 dollars per hour

(1) .92 acres of Spring Broccoli (seeded) followed with Cucumbers followed with Fall Broccoli (Transplanted)

(2) 2.43 acres of Tomatoes followed with Fall Broccoli (seeded)

(3) 16.65 acres of Cucumbers followed with Fall Broccoli (seeded)

The optimal farm plan used nearly 84 percent of the total operator labor available. Most of the excess labor was available in January, February, March and early April. During the week of October 22-28, 1216 hours of labor were purchased (approximately 30 people) primarily to harvest seeded fall broccoli.

Results of Scenario IIB

The objective value of the second scenario using 5.00 dollar per hour hired labor was 64,671 dollars, down 5,446 dollars from the 3.75 dollar model. The optimal enterprises were identical to the 3.75 dollar model. The planting seasons and acreage produced of each crop differed slightly. The cropping systems are as follows:

(1) 16.87 acres of Cucumbers followed with Fall Broccoli (seeded)

(2) 1.91 acres of Cucumbers followed with Fall Broccoli (transplanted)

(3) .68 acres of Spring Broccoli (seeded) followed by Cucumbers followed with Fall Broccoli (transplanted)

(4) .32 acres of Spring Broccoli (transplanted) followed with Cucumbers followed with Fall Broccoli (transplanted)

(5) .22 acres of Tomatoes followed with Fall Broccoli (transplanted).

The 5.00 dollar per hour model substituted a lower labor intensive crop (cucumbers) for a higher labor intensive crop (tomatoes). Tomato acreage dropped from 2.43 acres in scenario IIA to .22 acres in this scenario.

Economic theory suggests that when the price of an input increases, less of that input would be used. When the price of labor increased from 3.75 dollars to 5.00 dollars per hour, total labor use decreased from 5,093 hours to 4,220 hours.

Interpretation of MPSX Output for Scenario III

The coefficient of variation (CV) developed for each vegetable crop was used in the scenario as a measure of risk. Okra is the only low risk crop and was forced into the model at 10 acres. The exact planting week(s) was determined by the model. Cucumbers and spring broccoli, classified as high risk crops, were limited to a combined total of 5 acres. The remaining vegetable crops were chosen by the model. Wheat, peanuts, and the cow-calf operation were forced into the model as in the previous scenario. The optimal enterprise combination for the 3.75 dollar and the 5.00 per hour hired labor model are presented in Table XIX.

Results of Scenario IIIA

The value of the objective function for the 3.75 dollar per hour hired labor model was 56,956 dollars. The value on a per acre basis was 178 dollars.

Okra, which was forced in the model at 10 acres, was planted during the first week and was double cropped with transplanted fall broccoli. The model had a choice of growing cucumbers, spring broccoli or a

TABLE XIX

SUMMARY OF INPUT AND OUTPUT LEVELS IN MPSX OPTIMAL SOLUTION FOR SCENARIO THREE

Row	Week Planted	Unit	Optimal enterprise combination	
			A[1]	B[2]
Objective Function		Dollars	56952.06	46730.95
Cow-Calf		head	100.00	100.00
Quota Peanuts	May 14 - May 20	acres	16.70	16.70
Quota Peanuts	May 7 - May 13	acres	2.52	2.52
Quota Peanuts	Apr 30 - May 6	acres	2.78	2.78
Wheat	Sept 3 Sept 9	acres	17.06	----
Wheat	Oct 8 - Oct 14	acres	13.22	12.91
Wheat	Oct 15 - Oct 21	acres	27.72	45.09
Okra	Apr 9 - Apr 15	acres	10.00	10.00
Tomatoes	Apr 2 - Apr 8	acres	5.00	5.00
Cucumber	Apr 2 - Apr 8	acres	5.00	5.00
F. Broccoli (seeded)	Aug 13 - Aug 19	acres	5.00	5.00
F. Broccoli (seeded)	Aug 20 - Aug 26	acres	5.00	3.83
F. Broccoli (seeded)	Sep 3 - Sep 9	acres	---	1.17
F. Broccoli (TRPL)	Oct 1 - Oct 7	acres	9.08	9.08
F. Broccoli (TRPL)	Oct 8 - Oct 14	acres	.92	.92
Max Labor Hire	Apr 23 - Apr 29	hours	705.85	705.85
Max Capital Borrow	Jul 9 - Jul 15	dollars	21510.33	23285.97

[1] Hired labor charge of $3.75 dollars per hour

[2] Hired labor charge of $5.00 dollars per hour

combination of each on a maximum of five acres. The model chose to produce the upper limit of cucumbers and double crop the land with seeded fall broccoli. The remaining five acres were used to grow tomatoes which was also double cropped with seeded fall broccoli.

The optimal solution required 2130 hours of operator labor (85.2 percent of available labor) and 7949 hours of hired labor. The most labor hired in any one week was 706 hours which was purchased during the week of April 23-29. Most of this labor was required to stake, string, tie, and prune the five acres of tomatoes.

Results of Scenario IIIB

The value of the objective function for the 5.00 dollar per hour model is 46,731 dollars or 146 dollars per acre. The optimal crop mix for this scenario was not responsive to the increase in the wage rate. The optimal crop mix is identical to the 3.75 dollar per hour model except it staggered the fall seeded broccoli out and shortened the planting season of wheat.

Interpretation of MPSX Output for Scenario IV

This scenario was designed to determine the effects of the whole farm plan when vegetable prices are decreased by fifteen percent. The hypothetical farm was developed identical to the farm in the second scenario, 220 acres of pasture, 22 acres of quoted peanuts, 58 acres of wheat and 20 acres of vegetables. The difference between this scenario and the fifth one is that the relative risk of vegetable enterprises was not considered in this scenario. The results are analyzed using both 3.75 and 5.00 dollars per hour hired labor. The optimal enterprise combinations are listed in Table XX.

Results of Scenario IVA

The value of the objective function for the 3.75 dollar per hour model was 52,784 dollars, nearly 165 dollars per acre. All of the vegetable land was double cropped with the following cropping systems:

(1) .68 acres of Spring Broccoli (seeded) and Cucumbers

(2) .26 acres of Tomatoes and Fall Broccoli (seeded)

(3) 19.03 acres of Cucumbers and Fall broccoli (seeded)

The optimal farm plan used 82 percent of the available operator labor. The week of October 22-28 required the most hours of hired labor (1196) primarily to harvest the broccoli. The most operating capital that was borrowed at any one time was 16,761, the week prior to the start of cucumber and tomato harvest.

Results of Scenario IVB

Increasing the price of hired labor from 3.75 dollars per hour to 5.00 dollars per hour reduced the value of the objective value to 47,524 for this scenario. The optimal farm plan required 4183 hours of hired labor which is down slightly from the 3.75 dollar per hour model.

The optimal farm mix varies only slightly from the 3.75 dollar mix. The following double cropping systems were used in the optimal farm plan:

(1) 18.8 acres of Cucumbers and Fall Broccoli (seeded)

(2) 1.03 acres of Spring Broccoli (seeded) and Cucumbers

(3) .26 acres of Tomatoes and Fall Broccoli (seeded)

TABLE XX

SUMMARY OF INPUT AND OUTPUT LEVELS IN MPSX OPTIMAL SOLUTION FOR SCENARIO FOUR

Row	Week Planted	Unit	Optimal enterprise combination	
			A[1]	B[2]
Objective Function		Dollars	52783.94	47524.45
Cow-Calf		head	100.00	100.00
Quota Peanuts	Apr 30 - May 6	acres	17.38	17.29
Quota Peanuts	May 14 - May 20	acres	.29	4.71
Quota Peanuts	May 21 - May 27	acres	4.33	----
Wheat	Sept 10 - Sept 16	acres	35.25	42.16
Wheat	Sept 17 - Sept 23	acres	1.39	1.85
Wheat	Oct 8 - Oct 14	acres	21.36	13.99
S. Broccoli (seeded)	Feb 19 - Feb 25	acres	.06	.37
S. Broccoli (seeded)	Feb 26 - Mar 4	acres	.62	.66
Tomatoes	Apr 2 - Apr 8	acres	.28	.26
F. Broccoli (seeded)	Aug 13 - Aug 19	acres	17.21	16.86
F. Broccoli (seeded)	Aug 27 - Sept 2	acres	1.15	1.14
F. Broccoli (seeded)	Aug 20 - Aug 26	acres	.96	.96
Cucumbers	Apr 2 - Apr 8	acres	17.21	16.86
Cucumbers	Apr 9 - Apr 15	acres	----	.01
Cucumbers	Apr 23 - Apr 29	acres	1.83	1.84
Cucumbers	Jul 16 - Jul 22	acres	.29	.56
Cucumbers	Jul 23 - Jul 29	acres	.39	.48
Max Labor Hire	Oct 22 - Oct 28	hours	1195.54	1172.11
Max Capital Borrow	Jun 11 - Jun 17	dollars	16760.79	16752.31

[1] Hired labor charge of $3.75 dollars per hour

[2] Hired labor charge of $5.00 dollars per hour

Interpretation of MPSX output for Scenario V

The final scenario was developed to determine the effects of lower vegetable prices on the farm organization that considers the relative risk of the vegetable enterprises. The hypothetical farm is designed like the farm in scenario three, 220 acres of pasture land, 58 acres of wheat, 22 acres of quota peanuts and 20 acres of vegetable enterprises. Okra (low risk) was forced into the model at 10 acres. Spring broccoli and cucumbers was limited to a combined total of five acres. Vegetable product prices were reduced 15 percent and the effects on the whole farm plan for both 3.75 and 5.00 dollars per hour hired labor are analyzed. Table XXI lists the optimal enterprise mixes for this scenario.

Results of Scenario VA

The optimal solution had an objective function value of 38,178 dollars. The optimal farm plan for the 3.75 dollar model is not sensitive to a 15 percent vegetable product price decrease. The optimal crop mix remains the same as scenario three with the exception of changing the planting season of wheat.

Results of Scenario VB

When the price of hired labor is raised to 5.00 dollars per hour, the farm plan changes drastically. The value of the objective function falls to 29,668 dollars and sweet corn is included in the optimal crop mix. Four and one-half acres of hand harvested sweet corn is substituted for tomatoes as sweet corn requires less labor. In percentage terms, net returns of sweet corn is influenced less by a 15

TABLE XXI

SUMMARY OF INPUT AND OUTPUT LEVELS IN MPSX OPTIMAL SOLUTION FOR SCENARIO FIVE

Row	Week Planted	Unit	Optimal enterprise combination	
			A[1]	B[2]
Objective Function		Dollars	38178.11	29667.92
Cow-Calf		head	100.00	100.00
Quota Peanuts	Apr 30 - May 6	acres	2.78	10.79
Quota Peanuts	May 7 - May 13	acres	2.52	9.46
Quota Peanuts	May 14 - May 20	acres	16.70	1.75
Wheat	Oct 1 - Oct 7	acres	----	17.93
Wheat	Oct 8 - Oct 14	acres	13.22	31.32
Wheat	Oct 15 - Oct 21	acres	44.78	8.75
Okra	Apr 9 - Apr 15	acres	10.00	10.00
Tomatoes	Apr 2 - Apr 8	acres	5.00	.33
Tomatoes	Apr 23 - Apr 29	acres	----	.17
F. Broccoli (TRPL)	Oct 1 - Oct 7	acres	9.08	9.25
F. Broccoli (TRPL)	Oct 9 - Oct 15	acres	.92	.75
F. Broccoli (seeded)	Aug 13 - Aug 19	acres	5.00	9.50
F. Broccoli (seeded)	Aug 20 - Aug 26	acres	5.00	.33
F. Broccoli (seeded)	Sep 10 - Sept 16		----	.17
Cucumbers	Apr 2 - Apr 8	acres	5.00	5.00
Sweet Corn	Apr 2 - Apr 8	acres	----	3.65
Sweet Corn	Apr 9 - Apr 15	acres	----	.85
Max Labor Hire	Oct 22 - Oct 28	hours	----	666.67
Max Labor Hire	Apr 23 - Apr 29	hours	705.85	----
Max Capital Borrow	Jul 9 - Jul 15	dollars	22391.08	16897.41

[1] Hired labor charge of $3.75 dollars per hour

[2] Hired labor charge of $5.00 dollars per hour

percent product price reduction than is tomatoes. The cropping systems used in the optimal farm plan are as follows:

(1) 10.0 acres of Okra and Fall Broccoli (transplanted)

(2) 5.0 acres of Cucumbers and Fall Broccoli (seeded)

(3) 4.5 acres of Sweet Corn and Fall Broccoli (seeded)

(4) .5 acres of Tomatoes and Fall Broccoli (seeded)

Scenario Comparison of Cash Flow and Net Returns

Each of the scenarios were designed to compare hypothetical situations. This section deals with comparing the objective values, and cash flow of the scenarios. Table XXII presents the objective value and the total interest paid for each of the scenarios. In the following discussion the 3.75 dollar per hour hired labor models are analyzed.

Comparison of Scenario One to Scenario Two

Scenario one defined the base farm, no vegetables enterprises were allowed. In scenario two, twenty acres was diverted from small grain production (wheat) to vegetable production with no allowances of risk between the vegetable enterprises. When vegetables were added, the value of the objective function increased 55,325 dollars. Although more capital was borrowed in the second scenario, total interest paid decreased 230 dollars as the relative short growing season of the vegetables in the optimal solution enabled quicker pay back of the loans.

Comparison of Scenario Three to Scenario Two

In scenario three, the coefficient of variation of net returns was

TABLE XXII

VALUE OF THE OBJECTIVE FUNCTION AND TOTAL INTEREST PAID FOR ALL SCENARIOS

Scenario	Value of objective function	Total Interest Paid
A. Labor Charge = $3.75/hour		
I	14791.90	941.59
II	70117.36	711.46
III	56952.06	916.28
IV	52783.94	649.59
V	38178.11	1215.31
B. Labor Charge = $5.00/hour		
I	14683.99	947.38
II	64670.94	617.29
III	46730.95	1169.75
IV	47524.45	666.56
V	29667.92	1179.41

used as a measure of risk. Okra, the only low risk crop, was forced into the model at a minimum of 10 acres. Likewise spring broccoli and cucumbers, the high risk crops, were constrained a maximum combined of 5 acres. Placing these restrictions on the model reduced the value of the objective function 13,165 dollars from the second scenario. The restrictions also caused the total interest paid to increase 205 dollars.

Comparison of Scenario Four to Scenario Two

Scenario four was designed identically to scenario two, 20 acres of vegetable land with no restrictions on any one enterprise, except the product prices of the vegetables were decreased fifteen percent. The optimal farm plan included spring and fall broccoli, tomatoes, cucumbers, wheat, quota peanuts and the cow-calf operation for both scenarios. The value of the objective function decreased 17,333 dollars when vegetable prices were decreased fifteen percent. Total interest paid decreased approximately 62 dollars.

Comparison of Scenario Five to Scenario Three

Scenario five and scenario three both limited the acreage of high risk crops (cucumbers and spring broccoli) and forced in the low risk crop (okra). Scenario five, however, used fifteen percent lower vegetable product prices than did scenario three. The optimal farm plan remained the same for both scenarios. Lowering the vegetable prices reduced the value of the objective function 18,774 dollars and increased the amount of interest paid 299 dollars.

CHAPTER V

CONCLUSIONS AND RECOMMENDATIONS FOR FURTHER RESEARCH

Conclusions

Farm incomes in Atoka and Bryan counties are low. Increasing farm incomes can be accomplished by increasing yields, intensifying existing enterprises, adding enterprises or reducing cost. This study took the approach of adding alternative enterprises (vegetables) and examining the farm activities to see if land, labor, and capital can be used more efficiently to raise incomes.

In 1982, Bryan and Atoka counties harvested 563 acres of vegetables (U.S. Dept. of Commerce 1983). Numerous vegetables are adaptable to the climatic conditions but are not being extensively produced. Without potential profitability studies, marketing studies, and risk analysis, producers have little incentive to commercially produce vegetables. This study was designed to determine the profitability of including small acreages of vegetable enterprises with traditional enterprises. Production economic theory was used along with budgeting and linear programming to confront the problem.

Seventeen enterprise budgets with weekly time intervals for resources were developed using the Oklahoma State University Enterprise Budget Generator. Input requirements and prices were determined with the help of Oklahoma State University horticulturists and entomologists.

Output prices were determined from annual summaries of the Dallas Wholesale Market prices. The budgets represent crops that are adaptable to the climatic and soil conditions of Atoka and Bryan counties. The budgets developed indicated many vegetable enterprises could be profitable alternatives for producers in Southeastern Oklahoma. All showed higher returns than did the traditional enterprises used in the model.

The nonvegetable budgets were incorporated into a linear programming model and an optimal base farm enterprise mix was determined. Then vegetable enterprises were added to determine the potential profitability of changing traditional whole farm plans.

For all of the scenarios except the last one, raising the price of labor from 3.75 dollars per hour to 5.00 dollars per hour did not effect the optimal enterprise combination. The exact acreage produced of each crop did change when the labor price was increased. Unless otherwise specified the remainder of this chapter will refer to the 3.75 dollar per hour labor models.

The optimal base farm as determined by the first scenario returned 14,792 dollars above operating cost, operator labor, risk, management, and overhead. The enterprises selected in the solution included a 100 head cow-calf herd, 22 acres of quota peanuts, and 78 acres of wheat for grain. A very low portion of the available operator labor was used in this scenario.

In the second scenario, 20 acres were diverted from wheat production to vegetable production. The optimal vegetable mix included fall broccoli, cucumbers, tomatoes, and spring broccoli. Substituting 20 acres of vegetables for wheat increased the value of the objective function 55,326 dollars.

The third scenario took into account the price and yield risk differences between the vegetable crops. The value of the objective function for this scenario was 42,164 dollars greater than the first scenario, but 13,161 dollars less than the second scenario. The optimal vegetable mix of this scenario included okra, cucumbers, spring broccoli, and fall broccoli. This scenario may be useful to beginning vegetable growers because the returns are positive and large relative to the base farm, yet much of the yield and price risk of the second scenario are removed.

The fourth scenario was developed to determine the effects of the second scenario when all of the vegetable product prices decreased fifteen percent. The optimal enterprises were the same as the second scenario. A 15 percent reduction in product prices resulted in a 24.7 percent reduction in the value of the objective function.

The fifth scenario was developed to determine the effects of the third scenario when vegetable prices decreased fifteen percent. The optimal enterprises used in this model remained the same as the third scenario. The value of the objective function for the 3.75 dollar per hour model was 38,178. The objective value was 33 percent lower than the third scenario but was 23,386 dollars greater than the base farm. The enterprises that entered the optimal solution for the 5.00 dollar per hour model are Okra, Fall Broccoli, Cucumbers, Tomatoes, and Sweet Corn. The value of the objective value was 8,511 dollars less than the 3.75 dollar per hour hired labor model and 17,063 dollars less than scenario IIIB.

Recommendations for Further Research

Improving any economy is complex, with about as many hypothesis as unemployed people. This research neither attempts or makes recommendations to solve the difficult economic farm issues in the study area. Recommendations for further research is based primarily on the limitations of this study. This research dealt strictly with the micro aspects of an economic problem. How the micro problem fits into the macro scheme, and how a summation of micro changes effect the macro environment certainly needs to be studied. Numerous macroeconomic valuables could have a significant effect on the success of a vegetable industry in Southeast Oklahoma. The following is an example of some of the crucial questions that needs research.

1. Which would constrain profits first if vegetable production increased -- rising input costs, rising wage rates, or falling product prices because of oversupply?
2. Which regions of Oklahoma have location advantages due to climatic conditions, soils, and market locations?
3. What wage rates are necessary to insure a sufficient supply of labor?

Linear programming models are only as good as the data used to develop the model. The budgets were developed with the best information available. However, until more actual on farm production research is done and better information becomes available, the expected requirements of the inputs may be quite different than the actual.

Probably the weakest link in this study is the lack of time series yield data for vegetable production in the study area. The yield data used in this study were based on the experience of Oklahoma State University Extension Horticulturists. There are variety trials located at the Bixby Horticultural and Agronomic Experiment Station and on various farms across the state. Work currently being done at a new experiment station in Atoka county and with current producers should provide a basis for more reliable yield data.

For any agricultural enterprise to be successful, not only does the potential producer need to have the management skills and physical resources to produce the enterprise, he must also be able to market it. Effective marketing is crucial to successful vegetable production. Unlike the traditional enterprises grown in the area, the vegetable market is very imperfect. Timeliness, quality, and consistency are production traits, but they all greatly effect the ability to market the produce. For a commercial vegetable producer to be a successful marketer, he must develop long term business relationships with produce buyers. He must consistently produce a quality product and be ready for delivery when the buyer desires it. The long term commitment probably will restrict the grower from changing his product mix drastically each year. The marketing and production aspects of vegetable production need to be developed simultaneously, for without both together failure is almost assured.

Oklahoma will probably never replace Texas, California, or Florida as a major vegetable producing state. However, the imperfect climatic condition of every state helps create marketing windows - short periods in which an undersupply of vegetables results in unusually high prices. The size, strength and reliability of these windows need to be identified. Research then needs to be developed to determine if it is possible for Oklahoma vegetable producers to target these marketing windows.

The interaction of a group of farms producing vegetables for a vegetable marketing cooperative or packing plant needs to be analyzed. Once a vegetable packing facility is established, the scheduling of crops into the plant from various farms must be analyzed. The optimal product mix handled by the packing facility could influence the enterprise alternatives of the producers. The integration of a regional packing plant model with farm models may provide additional insights into the optimal crop mix for Atoka and Bryan counties.

One valuable asset of vegetable production is the ability of the manager to double and even triple crop his production. Economic analysis of the possible reduction of overall risk with multi-cropping systems needs to be done. It could be possible that although cucumbers and spring broccoli are relatively risky crops, the overall risk of the operation could be reduced when they are included in multi-cropping systems. Comparing the overall risk of vegetable cropping systems with the traditional enterprises would be very beneficial to potential producers and lenders.

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APPENDIX

MACHINERY COMPLEMENT AND ENTERPRISE BUDGETS

TABLE XXIII

MACHINERY COMPLEMENT OF HYPOTHETICAL FARM

COLUMN NAME OF MACHINE	1 CODE	2 WIDTH (FEET)	3 INITIAL LIST PRICE	4 SPEED (MPH)	5 FIELD EFFIC-ENCY	6 RC1	7 RC2	8 RC3	9 HOURS USED ANNUALLY	10 YEARS OWNED	11 RFV1	12 RFV2	13 PURCHASE PRICE	14 FUEL TYPE	15 HOURS OF LIFE	16 HP
TRACTOR(4)	4.	25.0	7000.	4.0	0 75	1.35	0.000631	1.60	600.	10.0	0.680	0.920	7000.	1.	9000.	25.
TRACTOR(6)	6.	40.0	11200.	4.0	0.75	1.35	0:000631	1.60	600.	10.0	0.680	0.920	11200.	3.	9000.	40.
ROTOTILER	15.	3.3	1025.	3.2	0 78	1.35	0.000631	1.60	600.	10.0	0.680	0.920	1025.	1.	1200.	8.
3PT. PLOW 2X14	31.	2.4	583.	3.3	0.68	2.00	0.002510	1.30	150.	10.0	0.600	0.885	583.	0.	1500.	0.
TANDEM DISC	33.	4.6	627.	3.5	0.71	0.65	0.000251	1.80	75.	10.0	0.600	0.885	627.	0.	1500.	0.
2 ROW CULTIVATOR	41.	5.5	1140.	2.6	0.65	1.00	0.000251	1.80	75.	10.0	0.600	0.885	1140.	0.	1500.	0.
SPIKE HARROW	44.	3.7	110.	5.0	0.59	0.65	0.000251	1.80	75.	10.0	0.600	0.885	110.	0.	1500.	0.
CULT.BEDER PLNT.	49.	3.0	1200.	4.5	0.57	0.80	0.000631	1.60	75.	8.0	0.600	0.885	1200.	0.	1020.	0.
PULL SPREADER	51.	60.0	0.	5.3	0.67	0.75	0.000251	1.80	50.	10.0	0.560	0.885	0.	0.	1000.	0.
BARREL SPRAYER	56.	19.7	220.	3.8	0.11	0.65	0.000251	1.80	50.	10.0	0.600	0.885	220.	0.	850.	0.
BOOM/GUN, 3PT	57.	23.6	2750.	3.5	0.10	0.65	0.000251	1.80	50.	10.0	0.600	0.885	2750.	0.	850.	0.
2RW TRANSPLANTER	59.	7.5	4750.	3.0	0.67	0.80	0.000631	1.60	80.	8 0	0.600	0.885	4750.	0.	1200.	0.
4 WHEEL TRAILER	65.	5.9	1300	20.0	0.07	0 50	0.002510	1.30	200.	10.0	0.635	0.885	1300.	0.	3000.	0.
DRILL W/FERT.	48.	13.3	4800.	3.5	).61	0.65	0.000251	1.80	25.	10.0	0.600	0.885	4800.	0.	850.	0.
LISTER	53.	6.0	990.	4.0	0.67	0.80	0.000631	1.60	60	10.0	0.600	0.885	990.	0.	1200.	0.

TABLE XXIV

BELL PEPPER BUDGET

BELL PEPPERS, S.E. OKLA.
SANDY LOAM SOILS, IRRIGATED
OWNED EQUIPMENT/HAND HARVEST

OPERATING INPUTS:	UNITS	PRICE	QUANTITY	VALUE	YOUR VALUE
HERB TREFLAN 4E	ACRE	3.750	1.000	3.75	________
15-15-15 FERT.	CWT.	9.750	3.500	34.13	________
RNTFERTSPRD/ACRE	ACRE	1.250	2.000	2.50	________
TRANSPLANTS	THPL	40.000	12.000	480 00	________
TRANSPLANT LABOR	HR.	3.750	12.000	45.00	________
PEST PYDRIN 2.4E	ACRE	12.000	5.000	60 00	________
FUNG MANZATE 200	ACRE	6.500	12.000	78.00	________
BACT KOCIDE 101	ACRE	7.500	9.000	67.50	________
PEST SEVIN 4F	ACRE	5.000	6.000	30.00	________
HAND HOEING	HR.	3.750	12.000	45.00	________
NITROGEN (N)	LBS.	0.330	50.000	16.50	________
CARTONS	CART	1.020	300.000	306.00	________
HAND HARVESTING	HR.	3.750	135.000	506 25	________
GRADING & MKTG	CART	0.760	300.000	228.00	________
ANNUAL OPERATING CAPITAL	DOL.	0.150	177 557	26.63	________
LABOR CHARGES	HR.	3.750	35.880	134 55	________
MACHINERY FUEL, LUBE, REPAIRS	ACRE			123.76	________
IRRIGATION FUEL, LUBE, REPAIRS	ACRE			33.25	________
TOTAL OPERATING COST				2220.82	________

FIXED COSTS		VALUE	YOUR VALUE
MACHINERY			
INTEREST AT 15.0%	DOL.	110.568	________
DEPR., TAXES, INSUR.	DOL.	111.799	________
IRRIGATION			
INTEREST AT 15.0%	DOL.	14.250	________
DEPR., TAXES, INSUR.	DOL.	19.000	________
LAND			
INTEREST AT 0.0%	DOL.	0.000	________
TAXES	DOL.	0.000	________
TOTAL FIXED COSTS		255.62	________

PRODUCTION:	UNITS	PRICE	QUANTITY	VALUE	YOUR VALUE
BELL PEPPERS	CART	9.800	300.000	2940.00	________
RETURNS ABOVE TOTAL OPERATING COSTS				719.18	________
RETURNS ABOVE ALL COSTS EXCEPT OVERHEAD, RISK AND MANAGEMENT				463.56	________

SIDEDRESS 150 LBS. 34-0-0 FERT. KOCIDE 3 LB.; WICKWIRE, SCHATZER, MOTES
TREFLAN .5 LBS.; PYDRIN .15LB; MANZATE1.5 LB.; ATOKA & BRYAN CO.
SOLD IN 30 LB. 1 1/9 BU CARTONS. DALLAS W.S. PRICE;

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PROGRAM DEVELOPED BY DEPT. OF AGRI. ECON. OKLAHOMA STATE UNIVERSITY

TABLE XXV

FALL BROCCOLI SEEDED BUDGET

FALL BROCOLLI, SEEDED
SANDY LOAM SOILS, IRRIGATED
OWNED EQUIPMENT/HAND HARVEST

OPERATING INPUTS:	UNITS	PRICE	QUANTITY	VALUE	YOUR VALUE
HERB TREFLAN 4E	CWT.	3.750	1.000	3.75	________
15-15-15 FERT.	CWT.	9.750	3.000	29.25	________
RNTFERTSPRD/ACRE	ACRE	1.250	3.000	3.75	________
SEED	LBS.	200.000	1.000	200.00	________
THIN SEEDLINGS	HR.	3.750	6.000	22.50	________
NITROGEN (N)	LBS.	0.330	80.000	26.40	________
PEST LANNATE	ACRE	4.000	4.000	16.00	________
CARTONS	CRAT	1.020	400.000	408.00	________
HAND HARVESTING	HR.	3.750	120.000	450.00	________
GRADING & MKTG	CRAT	1.330	400.000	532.00	________
ANNUAL OPERATING CAPITAL	DOL.	0.150	68.080	10.21	________
LABOR CHARGES	HR.	3.750	19.503	73.14	________
MACHINERY FUEL, LUBE, REPAIRS	ACRE			64.81	________
IRRIGATION FUEL, LUBE, REPAIRS	ACRE			29.75	________
TOTAL OPERATING COST				1869.56	________

FIXED COSTS		VALUE	YOUR VALUE
MACHINERY			
INTEREST AT 15.0%	DOL.	51.607	________
DEPR., TAXES, INSUR.	DOL.	51.793	________
IRRIGATION			
INTEREST AT 15.0%	DOL.	12.750	________
DEPR., TAXES, INSUR.	DOL.	17.000	________
LAND			
INTEREST AT 0.0%	DOL.	0.000	________
TAXES	DOL.	0.000	________
TOTAL FIXED COSTS		133.15	________

PRODUCTION:	UNITS	PRICE	QUANTITY	VALUE	YOUR VALUE
BROCCOLI	CRAT	6.990	400.000	2796.00	________
RETURNS ABOVE TOTAL OPERATING COSTS				926.44	________
RETURNS ABOVE ALL COSTS EXCEPT OVERHEAD, RISK AND MANAGEMENT				793.29	________

SIDEDRESS 120 LBS. 34-0-0 FERT. TWICE
TREFLAN .5 LB.;LANNATE 10 OZ.
SOLD IN 22 LB. CARTONS, DALLAS W.S. PRICE.

WICKWIRE, SCHATZER, MOTES
ATOKA & BRYAN CO.

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TABLE XXVI

FALL BROCCOLI TRANSPLANTED BUDGET

FALL BROCCOLI, TRANSPLANT, S.E. OKLA.
SANDY LOAM SOILS, IRRIGATED
OWNED EQUIPMENT/HAND HARVEST

OPERATING INPUTS:	UNITS	PRICE	QUANTITY	VALUE	YOUR VALUE
HERB TREFLAN 4E	ACRE	3.750	1.000	3.75	________
15-15-15 FERT.	CWT.	9.750	3.000	29.25	________
RNTFERTSPRD/ACRE	ACRE	1.250	3.000	3.75	________
TRANSPLANTS	THPL	30.000	14.500	435.00	________
TRANSPLANT LABOR	HR.	3.750	15.000	56.25	________
NITROGEN (N)	LBS.	0.330	80.000	26.40	________
PEST LANNATE	ACRE	4.000	4.000	16.00	________
CARTONS	CART	1.020	350.000	357.00	________
HAND HARVESTING	HR.	3.750	100.000	375.00	________
GRADING & MKTG	CART	1.330	350.000	465.50	________
ANNUAL OPERATING CAPITAL	DOL.	0.150	68.367	10.26	________
LABOR CHARGES	HR.	3.750	18.659	69.97	________
MACHINERY FUEL, LUBE, REPAIRS	ACRE			64.81	________
IRRIGATION FUEL, LUBE, REPAIRS	ACRE			15.75	________
TOTAL OPERATING COST				1928.68	________

FIXED COSTS		VALUE	YOUR VALUE
MACHINERY			
INTEREST AT 15.0%	DOL.	51.607	________
DEPR., TAXES, INSUR.	DOL.	51.793	________
IRRIGATION			
INTEREST AT 15.0%	DOL.	6.750	________
DEPR., TAXES, INSUR.	DOL.	9.000	________
LAND			
INTEREST AT 0.0%	DOL.	0.000	________
TAXES	DOL.	0.000	________
TOTAL FIXED COSTS		119.15	________

PRODUCTION:	UNITS	PRICE	QUANTITY	VALUE	YOUR VALUE
BROCCOLI	CART	6.990	375.000	2621.25	________
RETURNS ABOVE TOTAL OPERATING COSTS				692.57	________
RETURNS ABOVE ALL COSTS EXCEPT OVERHEAD, RISK AND MANAGEMENT				573.42	________

SIDEDRESS 120 LBS. 34-0-0 FERT. TWICE;
TREFLAN .5LB.; LANNATE 10 OZ. A.I. PER APPL.
22 LB. CARTONS, DALLAS WHOLESALE PRICE

WICKWIRE, SCHATZER, MOTES
ATOKA & BRYAN COUNTIES.

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TABLE XXVII

SPRING BROCCOLI SEEDED BUDGET

SPRING BROCCOLI, SEEDED
SANDY LOAM SOILS, IRRIGATED
OWNED EQUIPMENT/HAND HARVEST

OPERATING INPUTS:	UNITS	PRICE	QUANTITY	VALUE	YOUR VALUE
SEED	LBS.	200.000	1.000	200.00	______
HERB TREFLAN 4E	ACRE	3.750	1.000	3.75	______
15-15-15 FERT.	CWT.	9.750	3.000	29.25	______
RNTFERTSPRD/ACRE	ACRE	1.250	3.000	3.75	______
NITROGEN (N)	LBS.	0.330	80.000	26.40	______
THIN SEEDLINGS	HR.	3.750	6.000	22.50	______
PEST LANNATE	ACRE	4.000	7.000	28.00	______
CARTONS	CART	1.020	375.000	382.50	______
HAND HARVESTING	HR.	3.750	100.000	375.00	______
GRADING & MKTG	CART	1.330	375.000	498.75	______
ANNUAL OPERATING CAPITAL	DOL.	0.150	72.509	10.88	______
LABOR CHARGES	HR.	3.750	22.044	82.67	______
MACHINERY FUEL, LUBE, REPAIRS	ACRE			76.28	______
IRRIGATION FUEL, LUBE, REPAIRS	ACRE			22.75	______
TOTAL OPERATING COST				1762.47	______

FIXED COSTS		VALUE	YOUR VALUE
MACHINERY			
INTEREST AT 15.0%	DOL.	66.219	______
DEPR., TAXES, INSUR.	DOL.	66.650	______
IRRIGATION			
INTEREST AT 15.0%	DOL.	9.750	______
DEPR., TAXES, INSUR.	DOL.	13.000	______
LAND			
INTEREST AT 0.0%	DOL.	0.000	______
TAXES	DOL.	0.000	______
TOTAL FIXED COSTS		155.62	______

PRODUCTION:	UNITS	PRICE	QUANTITY	VALUE	YOUR VALUE
BROCCOLI	CART	7.230	375.000	2711.25	______
RETURNS ABOVE TOTAL OPERATING COSTS				948.78	______
RETURNS ABOVE ALL COSTS EXCEPT OVERHEAD, RISK AND MANAGEMENT				793.16	______

SIDEDRESS 120 LBS. 34-0-0 FERT TWICE
TREFLAN .5 LB.; LANNATE 10 OZ. PER APPL.
22 LB. CARTON, DALLAS W.S. PRICE

WICKWIRE, SCHATZER, MOTES
ATOKA & BRYAN CO.

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TABLE XXVIII

SPRING BROCCOLI TRANSPLANTED BUDGET

SPRING BROCCOLI, TRANSPLANT, S.E. OKLA.
SANDY LOAM SOILS, IRRIGATED
OWNED EQUIPMENT/HAND HARVEST

OPERATING INPUTS:	UNITS	PRICE	QUANTITY	VALUE	YOUR VALUE
HERB TREFLAN 4E	ACRE	3.750	1.000	3.75	________
15-15-15 FERT.	CWT.	9.750	3.000	29.25	________
RNTFERTSPRD/ACRE	ACRE	1.250	3.000	3.75	________
TRANSPLANTS	THPL	30.000	14.500	435.00	________
TRANSPLANT LABOR	HR.	3.750	15.000	56.25	________
NITROGEN (N)	LBS.	0.330	80.000	26.40	________
PEST LANNATE	ACRE	4.000	6.000	24.00	________
CARTONS	CART	1.020	350.000	357.00	________
HAND HARVESTING	HR.	3.750	100.000	375.00	________
GRADING & MKTG	CART	1.330	350.000	465.50	________
ANNUAL OPERATING CAPITAL	DOL.	0.150	91.928	13.79	________
LABOR CHARGES	HR	3.750	21.287	79.83	________
MACHINERY FUEL, LUBE, REPAIRS	ACRE			74.52	________
IRRIGATION FUEL, LUBE, REPAIRS	ACRE			19.25	________
TOTAL OPERATING COST				1963.28	________

FIXED COSTS		VALUE	YOUR VALUE
MACHINERY			
INTEREST AT 15.0%	DOL.	63.795	________
DEPR., TAXES, INSUR.	DOL.	64.485	________
IRRIGATION			
INTEREST AT 15.0%	DOL.	8.250	________
DEPR., TAXES, INSUR.	DOL.	11.000	________
LAND			
INTEREST AT 0.0%	DOL.	0.000	________
TAXES	DOL.	0.000	________
TOTAL FIXED COSTS		147.53	________

PRODUCTION:	UNITS	PRICE	QUANTITY	VALUE	YOUR VALUE
BROCCOLI	CART	7.230	350.000	2530.50	________
RETURNS ABOVE TOTAL OPERATING COSTS				567.22	________
RETURNS ABOVE ALL COSTS EXCEPT OVERHEAD, RISK AND MANAGEMENT				419.69	________

SIDEDRESS 120 LBS. 34-0-0 FERT. TWICE;
TREFLAN .5LB.; LANNATE 10 OZ. A.I. PER APPL.
22 LB. CARTONS, DALLAS WHOLESALE PRICE

WICKWIRE, SCHATZER, MOTES
ATOKA & BRYAN COUNTIES

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TABLE XXIX

CANTALOUPE BUDGET

SUMMER CANTALOUPE, S.E. OKLA
SANDY LOAM SOILS, IRRIGATED
OWNED EQUIPMENT/HAND HARVEST

OPERATING INPUTS:	UNITS	PRICE	QUANTITY	VALUE	YOUR VALUE
HERB SONALAN	ACRE	15.000	1.000	15.00	
15-15-15 FERT.	CWT.	9.750	3.000	29.25	
RNTFERTSPRD/ACRE	ACRE	1.250	2.000	2.50	
SEED	LBS.	6.000	2.000	12.00	
PEST LANNATE	ACRE	4.000	4.000	16.00	
NITROGEN (N)	LBS.	0.330	60.000	19.80	
HAND HOEING	HR.	3.750	8.000	30.00	
CRATES	CRAT	1.020	250.000	255.00	
HAND HARVESTING	HR.	3.750	100.000	375.00	
GRADING & MKTG	CRAT	0.940	250.000	235.00	
ANNUAL OPERATING CAPITAL	DOL.	0.150	42.784	6.42	
LABOR CHARGES	HR.	3.750	18.995	71.23	
MACHINERY FUEL, LUBE, REPAIRS	ACRE			62.56	
IRRIGATION FUEL, LUBE, REPAIRS	ACRE			29.75	
TOTAL OPERATING COST				1159.50	

FIXED COSTS		VALUE	YOUR VALUE
MACHINERY			
INTEREST AT 15.0%	DOL.	48.878	
DEPR., TAXES, INSUR.	DOL.	48.571	
IRRIGATION			
INTEREST AT 15.0%	DOL.	12.750	
DEPR., TAXES, INSUR.	DOL.	17.000	
LAND			
INTEREST AT 0.0%	DOL.	0.000	
TAXES	DOL.	0.000	
TOTAL FIXED COSTS		127.20	

PRODUCTION:	UNITS	PRICE	QUANTITY	VALUE	YOUR VALUE
CANTALOUPE	CRAT	6.770	250.000	1692.50	
RETURNS ABOVE TOTAL OPERATING COSTS				533.00	
RETURNS ABOVE ALL COSTS EXCEPT OVERHEAD, RISK AND MANAGEMENT				405.80	

PRE-MERG SONALAN 1.2 LB.; LANNATE 10 OZ.;
SIDEDRESS 180 LBS. 34-0-0 AT VINE RUNNING;
SOLD IN 38 LB. CRATES. DALLAS W.S. PRICE

WICKWIRE, SCHATZER, MOTES
ATOKA & BRYAN CO.

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TABLE XXX

CUCUMBER BUDGET

CUCUMBER, S.E. OKLA.
SANDY LOAM SOILS, IRRIGATED
OWNED EQUIPMENT/HAND HARVEST

OPERATING INPUTS:	UNITS	PRICE	QUANTITY	VALUE	YOUR VALUE
HERB SONALAN	ACRE	15.000	1.000	15.00	________
SEED	LBS.	14.000	1.500	21.00	________
15-15-15 FERT.	CWT.	9.750	3.500	34.13	________
RNTFERTSPRD/ACRE	ACRE	1.250	2.000	2.50	________
PEST PYDRIN 2.4E	ACRE	12.000	4.000	48.00	________
HAND HOEING	HR.	3.750	12.000	45.00	________
NITROGEN (N)	LBS.	0.330	50.000	16 50	________
CARTONS	CART	1.020	300.000	306.00	________
HAND HARVESTING	HR.	3.750	90.000	337.50	________
GRADING & MKTG	CART	1.000	300.000	300.00	________
ANNUAL OPERATING CAPITAL	DOL.	0.150	38.341	5.75	________
LABOR CHARGES	HR.	3.750	19.753	74.07	________
MACHINERY FUEL,LUBE,REPAIRS	ACRE			64.21	________
IRRIGATION FUEL,LUBE,REPAIRS	ACRE			28.00	________
TOTAL OPERATING COST				1297.66	________

FIXED COSTS		VALUE	YOUR VALUE
MACHINERY			
INTEREST AT 15.0%	DOL.	48.649	________
DEPR.,TAXES,INSUR.	DOL.	48.266	________
IRRIGATION			
INTEREST AT 15.0%	DOL.	12.000	________
DEPR.,TAXES,INSUR.	DOL.	16.000	________
LAND			
INTEREST AT 0.0%	DOL.	0.000	________
TAXES	DOL.	0.000	________
TOTAL FIXED COSTS		124.91	________

PRODUCTION:	UNITS	PRICE	QUANTITY	VALUE	YOUR VALUE
CUCUMBERS	CART	8.460	300.000	2538.00	________
RETURNS ABOVE TOTAL OPERATING COSTS				1240.34	________
RETURNS ABOVE ALL COSTS EXCEPT OVERHEAD,RISK AND MANAGEMENT				1115.43	________

PREMERG SONALAN 1.2LB. TREFLAN .5LB.;
INSECT PYDRIN .15LB.; 150 LBS. 34-0-0 FERT;
1 1/9 BU. CARTONS, DALLAS W.S. PRICE

WICKWIRE,SCHATZER,MOTES
ATOKA & BRYAN CO.

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TABLE XXXI

OKRA BUDGET

OKRA, SOUTHEAST OKLAHOMA
SANDY LOAM SOILS, IRRIGATED
OWNED EQUIPMENT/HAND HARVEST

OPERATING INPUTS:	UNITS	PRICE	QUANTITY	VALUE	YOUR VALUE
HERB TREFLAN 4E	ACRE	3.750	1.000	3.75	________
15-15-15 FERT.	CWT.	9.750	2.000	19.50	________
RNTFERTSPRD/ACRE	ACRE	1.250	2.000	2.50	________
SEED	LBS.	1.000	10.000	10.00	________
HAND HOEING	HR.	3.750	6.000	22.50	________
NITROGEN (N)	LBS.	0.330	20.000	6.60	________
PEST SEVIN 4F	ACRE	5.000	3.000	15.00	________
CARTONS	CART	1.020	500.000	510.00	________
HAND HARVESTING	HR.	3.750	290.500	1089.37	________
HAND HARVESTING	HR.	3.750	9.500	35.63	________
GRADING & MKTG	CART	0.580	485.000	281.30	________
GRADING & MKTG	CART	0.580	15.000	8.70	________
ANNUAL OPERATING CAPITAL	DOL.	0.150	64.503	9.68	________
LABOR CHARGES	HR.	3.750	36.997	138.74	________
MACHINERY FUEL,LUBE,REPAIRS	ACRE			114.76	________
IRRIGATION FUEL,LUBE,REPAIRS	ACRE			35.00	________
TOTAL OPERATING COST				2303.02	________

FIXED COSTS		VALUE	YOUR VALUE
MACHINERY			
INTEREST AT 15.0%	DOL.	70.604	________
DEPR.,TAXES,INSUR.	DOL.	68.034	________
IRRIGATION			
INTEREST AT 15.0%	DOL.	15.000	________
DEPR.,TAXES,INSUR.	DOL.	20.000	________
LAND			
INTEREST AT 0.0%	DOL.	0.000	________
TAXES	DOL.	0.000	________
TOTAL FIXED COSTS		173.64	________

PRODUCTION:	UNITS	PRICE	QUANTITY	VALUE	YOUR VALUE
OKRA	CART	5.420	485.000	2628.70	________
OKRA	CART	5.420	15.000	81.30	________
TOTAL RECEIPTS				2710.00	________
RETURNS ABOVE TOTAL OPERATING COSTS				406.97	________
RETURNS ABOVE ALL COSTS EXCEPT OVERHEAD,RISK AND MANAGEMENT				233.34	________

SIDEDRESS 60 LB. 34-0-0 FERT.;
INCORP TREFLAN .5LB.; SEVIN 1 LB.;
18 LB. CARTONS; DALLAS W.S. PRICE

WICKWIRE,SCHATZER,MOTES
ATOKA & BRYAN CO.

PROCESSED BY DEPT. OF AGRI. ECON. - OKLAHOMA STATE UNIVERSITY

TABLE XXXII

SNAP BEAN BUDGET

SNAP BEANS, S.E. OKLA.
SANDY LOAM SOILS, IRRIGATED
OWNED EQUIPMENT/HAND HARVEST

OPERATING INPUTS:	UNITS	PRICE	QUANTITY	VALUE	YOUR VALUE
HERB TREFLAN 4E	ACRE	3.750	1.000	3.75	
15-15-15 FERT.	CWT.	9.750	2.500	24.38	
RNTFERTSPRD/ACRE	ACRE	1.250	2.000	2.50	
SEED	LBS.	1.400	80.000	112.00	
PEST LANNATE	ACRE	4.000	3.000	12.00	
NITROGEN (N)	LBS.	0.330	25.000	8.25	
HAND HOEING	HR.	3.750	4.000	15.00	
BASKETS	BU.	1.020	120.000	122.40	
HAND HARVESTING	HR.	3.750	100.000	375.00	
GRADING & MKTG	BU.	0.830	120.000	99.60	
ANNUAL OPERATING CAPITAL	DOL.	0.150	35.369	5.31	
LABOR CHARGES	HR.	3.750	17.119	64.20	
MACHINERY FUEL, LUBE, REPAIRS	ACRE			58.19	
IRRIGATION FUEL, LUBE, REPAIRS	ACRE			14.00	
TOTAL OPERATING COST				916.57	

FIXED COSTS		VALUE	YOUR VALUE
MACHINERY			
INTEREST AT 15.0%	DOL.	42.524	
DEPR., TAXES, INSUR.	DOL.	41.902	
IRRIGATION			
INTEREST AT 15.0%	DOL.	6.000	
DEPR., TAXES, INSUR.	DOL.	8.000	
LAND			
INTEREST AT 0.0%	DOL.	0.000	
TAXES	DOL.	0.000	
TOTAL FIXED COSTS		98.43	

PRODUCTION:	UNITS	PRICE	QUANTITY	VALUE	YOUR VALUE
SNAP BEANS	BU.	10.070	120.000	1208.40	
RETURNS ABOVE TOTAL OPERATING COSTS				291.83	
RETURNS ABOVE ALL COSTS EXCEPT OVERHEAD, RISK AND MANAGEMENT				193.41	

SIDEDRESS 75 LBS. 34-0-0 FERT.;
TREFLAN .5 LB.; LANNATE 10 OZ.PER APPL.;
30 LB. BASKETS, DALLAS W.S. PRICE.

WICKWIRE, SCHATZEP, MOTES
ATOKA & BRYAN CO.

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TABLE XXXIII

SWEET CORN BUDGET

SUMMER SWEET CORN, S.E. OKLA.
SANDY LOAM SOIL IRRIGATED
OWNED EQUIPMENT/HAND HARVEST

OPERATING INPUTS:	UNITS	PRICE	QUANTITY	VALUE	YOUR VALUE
SEED	LBS.	3.000	10.000	30.00	________
HERB LASSO	ACRE	12.000	1.000	12.00	________
15-15-15 FERT.	CWT.	9.750	3.500	34.13	________
RNTFERTSPRD/ACRE	ACRE	1.250	2.000	2.50	________
NITROGEN (N)	LBS.	0.330	70.000	23.10	________
HAND HOEING	HR.	3.750	4.000	15.00	________
PEST PYDRIN 2.4	ACRE	12.000	9.000	108.00	________
CRATES	CRAT	1.020	180.000	183.60	________
HAND HARVESTING	HR.	3.750	8.000	30.00	________
GRADING & MKTG	CRAT	0.510	180.000	91.80	________
ANNUAL OPERATING CAPITAL	DOL.	0.150	42.744	6.41	________
LABOR CHARGES	HR.	3.750	22.438	84.14	________
MACHINERY FUEL, LUBE, REPAIRS	ACRE			79.00	________
IRRIGATION FUEL, LUBE, REPAIRS	ACRE			24.50	________
TOTAL OPERATING COST				724.18	________

FIXED COSTS		VALUE	YOUR VALUE
MACHINERY			
INTEREST AT 15.0%	DOL.	74.563	________
DEPR., TAXES, INSUR.	DOL.	75.776	________
IRRIGATION			
INTEREST AT 15.0%	DOL.	10.500	________
DEPR., TAXES, INSUR.	DOL.	14.000	________
LAND			
INTEREST AT 0.0%	DOL.	0.000	________
TAXES	DOL.	0.000	________
TOTAL FIXED COSTS		174.84	________

PRODUCTION:	UNITS	PRICE	QUANTITY	VALUE	YOUR VALUE
SWEET CORN	CRAT	7.170	180.000	1290.60	________
RETURNS ABOVE TOTAL OPERATING COSTS				566.42	________
RETURNS ABOVE ALL COSTS EXCEPT OVERHEAD, RISK AND MANAGEMENT				391.58	________

SIDEDRESS 205 LBS. 34-0-0 FERT.; LASSO 3 LBS.; PYDRIN .15 LB. PER APPL.; 45 LB. CRATES, DALLAS W.S. PRICE.

WICKWIRE, SCHATZER, MOTES
ATOKA & BRYAN CO.

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TABLE XXXIV

SWEET POTATO BUDGET

SWEET POTATOES, S.E. OKLA.
SANDY LOAM SOILS, IRRIGATED
OWNED EQUIPMENT/HAND HARVEST

OPERATING INPUTS:	UNITS	PRICE	QUANTITY	VALUE	YOUR VALUE
NEMATICIDE MOCAP	LBS.	1.100	80.000	88.00	________
HERB ENIDE	ACRE	45.000	1.000	45.00	________
15-15-15 FERT.	CWT.	9.750	2.000	19.50	________
RNTFERTSPRD/ACRE	ACRE	1.250	1.000	1.25	________
TRANSPLANTS	THPL	20.000	13.000	260.00	________
TRANSPLANT LABOR	HR.	3.750	15.000	56.25	________
PEST PARATHION	ACRE	4.000	2.000	8.00	________
HAND HOEING	HR.	3.750	24.000	90.00	________
HAND HARVESTING	HR.	3.750	90.000	337.50	________
BASKETS	BU.	1.020	300.000	306.00	________
GRADING & MKTG	BU.	0.660	300.000	198.00	________
ANNUAL OPERATING CAPITAL	DOL.	0.150	228.921	34.34	________
LABOR CHARGES	HR.	3.750	17.960	67.35	________
MACHINERY FUEL, LUBE, REPAIRS	ACRE			58.46	________
IRRIGATION FUEL, LUBE, REPAIRS	ACRE			42.00	________
TOTAL OPERATING COST				1611.65	________

FIXED COSTS		VALUE	YOUR VALUE
MACHINERY			
INTEREST AT 15.0%	DOL.	42.300	________
DEPR., TAXES, INSUR.	DOL.	41.595	________
IRRIGATION			
INTEREST AT 15.0%	DOL.	18.000	________
DEPR., TAXES, INSUR.	DOL.	24.000	________
LAND			
INTEREST AT 0.0%	DOL.	0.000	________
TAXES	DOL.	0.000	________
TOTAL FIXED COSTS		125.90	________

PRODUCTION:	UNITS	PRICE	QUANTITY	VALUE	YOUR VALUE
SWEET POTATOES	BU.	7.940	300.000	2382.00	________
RETURNS ABOVE TOTAL OPERATING COSTS				770.35	________
RETURNS ABOVE ALL COSTS EXCEPT OVERHEAD, RISK AND MANAGEMENT				644.45	________

MOCAP 10E 4 LBS. ENIDE 5 LBS.;
PARATHION .5 LB.;DIG WITH 2X14 PLOW;
SOLD IN BU. BASKETS, DALLAS W.S. PRICE.

WICKWIRE, SCHATZER, MOTES
ATOKA & BRYAN CO.

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TABLE XXXV

STAKED TOMATO BUDGET

STAKED TOMATOES, S.E. OKLA.
SANDY LOAM SOILS, IRRIGATED
OWNED EQUIPMENT/HAND HARVEST

OPERATING INPUTS:	UNITS	PRICE	QUANTITY	VALUE	YOUR VALUE
HERB TREFLAN 4E*	ACRE	3.750	1.000	3.75	________
15-15-15 FERT.	CWT.	9.750	3.350	32.66	________
POTASH (K2O)	LBS.	0.130	100.000	13.00	________
RNTFERTSPRD/ACRE	ACRE	1.250	2.000	2.50	________
TRANSPLANTS	THPL	50.000	5.000	250.00	________
TRANSPLANT LABOR	HR.	3.750	8.000	30.00	________
STAKES	EACH	0.250	834.000	208.50	________
STRING	LBS.	1.250	30.000	37.50	________
STAKING LABOR	HR.	3.750	50.000	187.50	________
PRUNING & TIEING	HR.	3.750	180.000	675.00	________
HAND HOEING	HR.	3.750	9.000	33.75	________
PEST LANNATE	ACRE	4.000	10.000	40.00	________
BACT KOCIDE 101	ACRE	7.500	10.000	75 00	________
FUNG MANZATE 200	ACRE	6.500	4.000	26.00	________
NITROGEN (N)	LBS.	0.330	50.000	16.50	________
FUNG BRAVO AG 50	ACRE	12.400	6.000	74.40	________
LUGS	LUGS	0.600	700.000	420 00	________
HAND HARVESTING	HR.	3.750	200.000	750.00	________
GRADING & MKTG	LUGS	0.750	700.000	525.00	________
ANNUAL OPERATING CAPITAL	DOL.	0.150	336.492	50.47	________
LABOR CHARGES	HR.	3.750	36.596	137.23	________
MACHINERY FUEL, LUBE, REPAIRS	ACRE			123.05	________
IRRIGATION FUEL, LUBE, REPAIRS	ACRE			31.50	________
TOTAL OPERATING COST				3743.32	________

FIXED COSTS		VALUE	YOUR VALUE
MACHINERY			
INTEREST AT 15.0%	DOL.	96.599	________
DEPR., TAXES, INSUR.	DOL.	97.612	________
IRRIGATION			
INTEREST AT 15.0%	DOL.	13.500	________
DEPR., TAXES, INSUR.	DOL.	18.000	________
LAND			
INTEREST AT 0.0%	DOL.	0.000	________
TAXES	DOL.	0.000	________
TOTAL FIXED COSTS		225.71	________

PRODUCTION:	UNITS	PRICE	QUANTITY	VALUE	YOUR VALUE
TOMATOES	LUGS	7.530	700.000	5271.00	________
RETURNS ABOVE TOTAL OPERATING COSTS				1527.68	________
RETURNS ABOVE ALL COSTS EXCEPT OVERHEAD, RISK AND MANAGEMENT				1301.97	________

REPLACE 1/3 OF STAKES PER YR.;BRAVO 1.5LB;
150 LBS. 34-0-0; KOCIDE 3LB.; MANZATE 1.5LB;

WICKWIRE, SCHATZER, MOTES
ATOKA & BRYAN CO.

TABLE XXXVI

WATERMELON BUDGET

SUMMER WATERMELON, S.E. OKLA.
SANDY LOAM SOILS, IRRIGATED
OWNED EQUIPMENT/HAND HARVEST

OPERATING INPUTS:	UNITS	PRICE	QUANTITY	VALUE	YOUR VALUE
HERB SONALAN	ACRE	7.500	1.000	7.50	________
SEED	LBS.	6.000	1.500	9.00	________
15-15-15 FERT.	CWT.	9.750	2.000	19.50	________
POTASH (K2O)	LBS.	0.130	50.000	6.50	________
RNTFERTSPRD/ACRE	ACRE	1.250	2.000	2.50	________
HERB TREFLAN 4E	ACRE	3.750	1.000	3.75	________
PEST PYDRIN 2.4	ACRE	12.000	3.000	36.00	________
NITROGEN (N)	LBS.	0.330	30.000	9.90	________
HAND HOEING	HR.	3.750	9.000	33.75	________
FRUIT PRUNING	HR.	3.750	4.000	15.00	________
HAND HARVESTING	HR.	3.750	32.000	120.00	________
GRADING & MKTG	CWT.	0.890	140 000	124.60	________
ANNUAL OPERATING CAPITAL	DOL.	0.150	49.943	7.49	________
LABOR CHARGES	HR.	3.750	18.222	68.33	________
MACHINERY FUEL,LUBE,REPAIRS	ACRE			58.67	________
IRRIGATION FUEL,LUBE,REPAIRS	ACRE			29.75	________
TOTAL OPERATING COST				552.24	________

FIXED COSTS		VALUE	YOUR VALUE
MACHINERY			
INTEREST AT 15.0%	DOL.	43.385	________
DEPR.,TAXES,INSUR.	DOL.	42.836	________
IRRIGATION			
INTEREST AT 15.0%	DOL.	12.750	________
DEPR.,TAXES,INSUR.	DOL.	17.000	________
LAND			
INTEREST AT 0.0%	DOL.	0.000	________
TAXES	DOL.	0.000	________
TOTAL FIXED COSTS		115.97	________

PRODUCTION:	UNITS	PRICE	QUANTITY	VALUE	YOUR VALUE
WATERMELONS	CWT.	4.430	140.000	620.20	________
RETURNS ABOVE TOTAL OPERATING COSTS				67.96	________
RETURNS ABOVE ALL COSTS EXCEPT OVERHEAD,RISK AND MANAGEMENT				-48.02	________

SIDEDRESS 90 LBS. 34-0-0 FERT; PYDRIN .15 LB. WICKWIRE,SCHATZER,MOTES
SONALAN .75 LB.;TREFLAN .5 LB.; ATOKA & BRYAN COUNTIES
SOLD BULK CWT. DALLAS W.S. PRICES

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TABLE XXXVII

COW-CALF BUDGET

COW-CALF OPERATION
FESCUE-BERMUDA PASTURE
COST/COW 100 COW UNIT

OPERATING INPUTS:	UNITS	PRICE	QUANTITY	VALUE	YOUR VALUE
SALT & MIN.	LBS.	0.090	26.880	2.42	________
VET & MED.	DOL.	5.500	1.120	6.16	________
PARASITE CONTROL	DOL.	4.000	1.120	4.48	________
HAULING & MKTG	CWT.	0.750	4.410	3.31	________
SUPPLIES	HD.	3.500	1.120	3.92	________
BULLS	CWT.	100.000	0.140	14.00	________
41-45% PROTEIN	LBS.	0.185	67.200	12 43	________
NITROGEN	LBS.	0.330	185.000	61.05	________
PHOSPHATE (P205)	LBS.	0.250	132.000	33.00	________
POTASH (K20)	LBS.	0.130	132.000	17.16	________
RENT FERT SPREAD	ACRE	1.250	4.400	5.50	________
1/10 EST PASTURE	ACRE	382.360	0.100	38.24	________
GRASS HAY	TONS	52.000	0.504	26.21	________
FEED & CARE	HR.	3.750	1.200	4.50	________
MISC LABOR	HR.	3.750	2.250	8.44	________
ANNUAL OPERATING CAPITAL	DOL.	0.150	86.700	13.00	________
LABOR CHARGES	HR.	3.750	0.014	0.05	________
MACHINERY FUEL, LUBE, REPAIRS	ACRE			0.08	________
TOTAL OPERATING COST				253.94	________

FIXED COSTS		VALUE	YOUR VALUE
MACHINERY			
INTEREST AT 15.0%	DOL.	0.052	________
DEPR., TAXES, INSUR.	DOL.	0.058	________
LAND			
INTEREST AT 0.0%	DOL.	0.000	________
TAXES	DOL.	0.000	________
TOTAL FIXED COSTS		0.11	________

PRODUCTION:	UNITS	PRICE	QUANTITY	VALUE	YOUR VALUE
ST CALVES(460)	CWT.	71.000	1.978	140.44	________
HFR CALVES(430)	CWT.	67.000	1.333	89.31	________
COM. COWS	CWT.	42.000	0.950	39.90	________
AGED BULL	CWT.	46.000	0.160	7.36	________
TOTAL RECEIPTS				277.01	________
RETURNS ABOVE TOTAL OPERATING COSTS				23.07	________
RETURNS ABOVE ALL COSTS EXCEPT OVERHEAD, RISK AND MANAGEMENT				22.96	________

2.20 ACRES PER COW
ASSUMES 86% CALF CROP
SPRING CALVING

TABLE XXXVIII

GRAIN SORGHUM BUDGET

GRAIN SORGHUM: CUSTOM HARVEST (BASE WK)
SANDY LOAM SOILS
SOUTHEASTERN OKLAHOMA

OPERATING INPUTS:	UNITS	PRICE	QUANTITY	VALUE	YOUR VALUE
GRAIN SORG SEED	LBS.	0.750	5.000	3.75	________
15-15-15 FERT.	LBS.	9.750	1.000	9.75	________
RNTFERTSPRD/ACRE	ACRE	1.250	2.000	2.50	________
HERB ATRAZINE	ACRE	7.500	1.000	7.50	________
NITROGEN (N)	LBS.	0.330	40.000	13.20	________
PEST DIAZON	ACRE	3.000	1.000	3.00	________
CUSTOM COMBINE	ACRE	10.000	1.000	10.00	________
CUSTOM HAULING	CWT.	0.200	40.000	8.00	________
ANNUAL OPERATING CAPITAL	DOL.	0.150	21.839	3.28	________
LABOR CHARGES	HR.	3.750	4.062	15.23	________
MACHINERY FUEL, LUBE, REPAIRS	ACRE			14.77	________
TOTAL OPERATING COST				90.98	________

FIXED COSTS		VALUE	YOUR VALUE
MACHINERY			
INTEREST AT 15.0%	DOL.	16.260	________
DEPR., TAXES, INSUR.	DOL.	16.544	________
LAND			
INTEREST AT 0.0%	DOL.	0.000	________
TAXES	DOL.	0.000	________
TOTAL FIXED COSTS		32.80	________

PRODUCTION:	UNITS	PRICE	QUANTITY	VALUE	YOUR VALUE
GRAIN SORGHUM	CWT.	4.600	22.400	103.04	________
RETURNS ABOVE TOTAL OPERATING COSTS				12.06	________
RETURNS ABOVE ALL COSTS EXCEPT OVERHEAD, RISK AND MANAGEMENT				-20.74	________

DIAZINON .5 LB.
CUSTOM APPLICATION OF ATRAZINE

WICKWIRE, SCHATZER
ATOKA & BRYAN CO.

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TABLE XXXIX

PEANUT (NON QUOTA) BUDGET

PEANUT DRYLAND(BASE WK)
SANDY LOAM SOILS NON-IRIG.
SMALL FARMS (NON QUOTA)

OPERATING INPUTS.	UNITS	PRICE	QUANTITY	VALUE	YOUR VALUE
PEANUT SEED	LBS.	0.700	70.000	49 00	
NITROGEN (N)	LBS	0.330	15 000	4.95	
PHOSPH (P2O5)	LBS.	0.250	30.000	7.50	
POTASH (K2O)	LBS.	0.130	30 000	3 90	
DNP AMIZE	ACRE	3.750	1.000	3.75	
LEAF SPOT DETHAN	ACRE	4.500	4.000	18 00	
TERRACHLOR	ACRE	3.500	2 000	7 00	
RNTFERTSPRD/ACRE	ACRE	1.250	1.000	1.25	
STORE&PROC. EQPT	CWT.	0 400	17 000	6.80	
ORGANIZATIONS	TONS	1.500	0 850	1.27	
WAREHOUSING	TONS	13.490	0 850	11.47	
CUST.HARV.&HAUL	ACRE	35.000	1.000	35 00	
ANNUAL OPERATING CAPITAL	DOL.	0.150	46 332	6.95	
LABOR CHARGES	HR.	3.750	7 606	28.52	
MACHINERY FUEL, LUBE, REPAIRS	ACRE			28.01	
TOTAL OPERATING COST				213.37	

FIXED COSTS		VALUE	YOUR VALUE
MACHINERY			
INTEREST AT 15.0%	DOL.	18.545	
DEPR., TAXES, INSUR.	DOL.	17.771	
LAND			
INTEREST AT 0.0%	DOL.	0.000	
TAXES	DOL.	0.000	
TOTAL FIXED COSTS		36.32	

PRODUCTION:	UNITS	PRICE	QUANTITY	VALUE	YOUR VALUE
PEANUTS	CWT.	13.000	17.000	221.00	
RETURNS ABOVE TOTAL OPERATING COSTS				7.63	
RETURNS ABOVE ALL COSTS EXCEPT OVERHEAD, RISK AND MANAGEMENT				-28.69	

TERRACHLOR INCORP. PLANTING & SPREAD AT CULT. TREAT SEED WITH DITHENE LEAF SPOT

WICKWIRE, SCHATZER
ATOKA & BRYAN CO.

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TABLE XL

PEANUT (QUOTA) BUDGET

PEANUT DRYLAND(BASE WK)
SANDY LOAM SOILS NON-IRIG.
SMALL FARMS(QUOTA)

OPERATING INPUTS:	UNITS	PRICE	QUANTITY	VALUE	YOUR VALUE
PEANUT SEED	LBS.	0.700	70.000	49 00	________
NITROGEN (N)	LBS.	0.330	15 000	4 95	________
PHOSPH (P205)	LBS.	0.250	30.000	7.50	________
POTASH (K20)	LBS.	0 130	30.000	3 90	________
DNP AMIZE	ACRE	3.750	1 000	3.75	________
LEAF SPOT DETHAN	ACRE	4.500	4 000	18.00	________
TERRACHLOR	ACRE	3.500	2.000	7 00	________
RNTFERTSPRD/ACRE	ACRE	1.250	1 000	1 25	________
STORE&PROC. EQPT	CWT.	0.400	17.000	6.80	________
ORGANIZATIONS	TONS	1.500	0.850	1.27	________
WAREHOUSING	TONS	13.490	0 850	11 47	________
CUST HARV.&HAUL	ACRE	35.000	1.000	35.00	________
ANNUAL OPERATING CAPITAL	DOL.	0.150	46.332	6.95	________
LABOR CHARGES	HR.	3 750	7.606	28 52	________
MACHINERY FUEL, LUBE, REPAIRS	ACRE			28 01	________
TOTAL OPERATING COST				213 37	________

FIXED COSTS		VALUE	YOUR VALUE
MACHINERY			
INTEREST AT 15.0%	DOL.	18.545	________
DEPR., TAXES, INSUR.	DOL.	17.771	________
LAND			
INTEREST AT 0.0%	DOL.	0.000	________
TAXES	DOL.	0.000	________
TOTAL FIXED COSTS		36.32	________

PRODUCTION:	UNITS	PRICE	QUANTITY	VALUE	YOUR VALUE
PEANUT SEED	CWT.	24.000	17.000	408 00	________
RETURNS ABOVE TOTAL OPERATING COSTS				194 63	________
RETURNS ABOVE ALL COSTS EXCEPT OVERHEAD, RISK AND MANAGEMENT				158.31	________

TERRACHLOR INCORP. PLANTING & SPREAD AT CULT. TREAT SEED WITH DITHENE LEAF SPOT

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TABLE XLI

WHEAT BUDGET

WINTER WHEAT S.E. OKLA.(BASE WK)
SANDY LOAM SOILS NON-IRIG.
SMALL FARMS

OPERATING INPUTS:	UNITS	PRICE	QUANTITY	VALUE	YOUR VALUE
WHEAT SEED	BU.	4.300	1.500	6.45	______
NITROGEN (N)	LBS.	0.330	51.000	16.83	______
PHOSPH (P205)	LBS.	0.250	46.000	11.50	______
RNTFERTSPRD/ACRE	ACRE	1.250	2.000	2.50	______
CUST.HARV.&HAUL	ACRE	27.000	1.000	27.00	______
ANNUAL OPERATING CAPITAL	DOL.	0.150	26.007	3.90	______
LABOR CHARGES	HR.	3.750	2.192	8.22	______
MACHINERY FUEL, LUBE, REPAIRS	ACRE			8.03	______
TOTAL OPERATING COST				84.43	______

FIXED COSTS		VALUE	YOUR VALUE
MACHINERY			
INTEREST AT 15.0%	DOL.	9.327	______
DEPR., TAXES, INSUR.	DOL.	9.402	______
LAND			
INTEREST AT 0.0%	DOL.	0.000	______
TAXES	DOL.	0.000	______
TOTAL FIXED COSTS		18.73	______

PRODUCTION:	UNITS	PRICE	QUANTITY	VALUE	YOUR VALUE
WHEAT	BU.	3.200	33.000	105.60	______
PASTURE	AUMS	0.000	0.600	0.00	______
TOTAL RECEIPTS				105.60	______
RETURNS ABOVE TOTAL OPERATING COSTS				21.17	______
RETURNS ABOVE ALL COSTS EXCEPT OVERHEAD, RISK AND MANAGEMENT				2.44	______

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Master of Science

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