A COMPUTERIZED COST AND RETURN ANALYSIS FOR PRODUCING DIFFERENT WATERMELON VARIETIES IN OKLAHOMA

By

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CHAPTER 1

INTRODUCTION

Since 1629 when watermelon production began on the American continent, production methods and research interest has changed by considerable amounts (Gastier). Watermelon production has evolved from small-scale subsistence production to large-scale commercial producers that use intense farming practices. Researchers have studied different methods of production such as, pests and diseases that effect yield, and the cost-benefit analysis of production. Now that watermelon production is an expanding portion of agricultural total value, more research is going into the cost-benefit analysis of production for beginning and expanding producers.

Researchers have completed cost-benefit analysis for Oklahoma watermelon production previously. Schatzer and Motes produced an enterprise budget for Oklahoma watermelon production on irrigated, sandy loam soil (Schatzer and Motes). In addition, Bolin et al. developed a cost and return examination for Oklahoma seedless, irrigated watermelons (Bolin et al.). The preceding studies have focused on certain limited aspects of watermelon production. Prior research based Oklahoma studies on best estimates of production, in a format that was not interactive with the user. The budgeting programs that researchers developed for interactive use were complicated and difficult to use effectively. No producer interactive format has been developed for watermelon to allow for variable production options. For example, variety, fertilization

amount, yield, and other similar variables were predetermined in previous studies and to change rates you had to enter your new rates in the your farm area and then recalculate the entire budget. In the new computerized version of the enterprise budget entering revised values in the cells of the spreadsheet changes estimates of costs and returns. The program automatically readjusts for the new values in cells. This format allows the interested person to recalculate the budget easily.

Industry Outlook

According to the 1992 United States agricultural census, the nation had 1,925,300 farms with 945,531,506 acres of land in farms, an average of 491 acres per farm (USDA (a) 1992). In 1992, 10,706 farms in the U.S. produced 220,244 acres of watermelons. Farmers irrigated 46.3% of the acres (USDA (a) 1992). The 1997 United States agricultural census showed the nation had 1,911,859 farms with 931,795,255 acres of land in farms, an average of 487 acres per farm (USDA (b) 1997). In 1997, 8,623 farms in the U.S. produced 177,469 acres of watermelons. Farmers irrigated 56.5% of the acres (USDA (b) 1997).

The census shows that there was a slight decrease in the number of farms in the U.S. and a decrease in the acreage per farm. It also indicates that U.S. watermelon growers increased the number of irrigated acres even though the number of farms in watermelon production decreased.

The overall U.S trend in watermelon production and trade from 1996 to 2001 according to FAOSTAT data shows many changes in watermelon production. Area of watermelon harvested declined from 80,640 hectares to 65,000 hectares. Yield per

hectare of watermelon increased from 240,327 kg/ha to 255,385 kg/ha. Total U.S. watermelon production numbers fell from 1,938,000 Mt to 1,660,000 Mt. Import quantities and import values increased between 1996 and 2001. Export quantity fluctuated over the six years, but was slightly lower in 2001 than in 1996. The export value rose from $34,054,000 to $40,087,000.

If the current trend continues, U.S. watermelon production will continue to decline, with the export value rising. Total market value of U.S. watermelon production is difficult to determine because producers sell a portion of the produce at local markets and used some for personal consumption. In addition, watermelon is a fruit that is very susceptible to spoilage so the overall market and trade value is difficult to accurately determine. If producers are exiting the export market and market value is increasing, there is potential for new producers to enter production as well as existing producers to expand their acreage in an enterprise that is potentially profitable.

In comparison, Oklahoma has less average acres per farm than the national average. The data from the 1992 census established 66,937 farms with 32,143,030 acres of land in farms in Oklahoma giving an estimated 480 acres per farm (USDA (a) 1992). In 1992, 299 farms in Oklahoma produced 7,725 acres of watermelons. Farmers irrigated 32.7% of the acres (USDA (a) 1992). Results of the 1997 census show Oklahoma had 74,214 farms with 33,218,677 acres of land in farms yielding an average of approximately 448 acres of land (USDA (b) 1997). In 1997 292 farms in Oklahoma produced 5,724 acres of watermelons. Farmers irrigated 17.7% of the acres (USDA (b) 1997).

The trend in Oklahoma shows both a decline in percent watermelon production using irrigation practices and a decline in total watermelon acreage. U.S. data implies an increase in the percent of watermelon acreage irrigated, but a reduction in overall watermelon acreage.

Problem Statement

Though the preceding data may indicate a possibility for profitability, producers need correct information and the facts to determine if their land as well as other owned inputs are compatible for watermelon production. Production management practices for watermelons have become capital and labor intensive, therefore individuals need a complete outlook of the situation to adequately conclude if watermelon production will result in a profit. Since the variables of production can change in response or separately from each other, a non-detailed, computer based, farmer interactive analysis provides a single point in time glimpse at the production possibilities and costs.

Researchers have not collected and published Oklahoma watermelon variable input usage data on a county-by-county basis. Using data collected from a survey of Oklahoma producers, information that is more accurate can be determined on location, yield, production practice, cost of production practices, and other variables previously considered based only on a statewide average. An adjustable cost-benefit analysis will help producers weigh and understand the profit or loss aspects of watermelon production.

Objectives

The main objective is to determine default values for a computerized cost-benefit analysis of watermelon production for Oklahoma given the production methods and input constraints considered normal or traditional for producers. Specific objectives are:

1. Develop an excel spreadsheet that can be used by producers, researchers, lenders, and etc. that includes default levels of variable inputs for watermelon production and their associated costs, yields, and revenues.
2. Provide individuals producing watermelons a convenient way to estimate their business returns, financial ratios, and other desired accounting calculations.
3. Provide a summary of the costs and returns based on observations from a survey of Oklahoma watermelon producers.

CHAPTER 2

REVIEW OF LITERATURE

Agricultural producers face many decisions. Among these decisions are what to produce and in what quantities. They also want to know how much profit they can make from the production activity. Oklahoma agricultural producers have many alternative opportunities for production decisions and profit. Watermelon production profits in Oklahoma are variable. In deciding whether watermelon production is profitable in a certain location and for a certain producer, the producer should construct a cost-benefit analysis to allow an understanding of the practices required to obtain a return. A review of past watermelon research, the inputs and outputs of watermelon production, management types, and an understanding of the cost-benefit analysis will provide agricultural producers an opportunity to better understand profitability in watermelon production.

Production practices for watermelon have evolved for many generations over many centuries. When man first produced watermelons is difficult to determine as man has produced watermelons since, and probably before, accurate records were kept. Commercialized watermelon production has evolved with the science and no one has established an actual date as to its introduction. Worldwide watermelon production topped 77 million metric tons in 2001 (Taylor and Brant, 2002). There are roughly 200 varieties of watermelons in the United States. Producers in Oklahoma use commercially at least 25 different varieties. Seed companies have several varieties available for sale to

farmers. Predicting a particular producer's expected watermelon yields is difficult due to the unique characteristics of each field's market, soil type, physical location, choice of variety and the weather for a particular season.

Influential research

Previous and ongoing research aids in the estimation of expected watermelon yields and profit. Previous research has examined the effects of irrigation, planting density, mulch, row covers, triploid and diploid plants, genetic information, sugar content, insect and disease impact.

The impact of irrigation has been the topic of many previous research efforts. Watermelon yields increased when producers used nitrogen in trickle-irrigated systems (Pier and Doerge (1995a). Pier and Doerge (1995b) examined the impact of trickle-irrigation systems on the physical productivity, economic profit, and environmental quality. These two Arizona studies showed that trickle irrigation produced optimal fruit with minimal risk of ground water contamination.

Clark, Maynard, and Stanley (1996) evaluated drip irrigation in humid regions in terms of efficiency and best timing schedule. In general, they showed irrigation increased yield if the application rate was within a certain time range, thus avoiding increased disease problems.

They found drip irrigation is preferred to sprinkler or gravity (surface) irrigation if control of water flow and applications are the primary concern. Drip irrigation application rates were evaluated at different levels and at different points in the growing

season to determine the optimal time and application rate at that particular time (Clark, Maynard, and Stanley, 1996).

Plant density also affected yield results. Yield per acre was best when plants per unit area were limited (Duthie et al.1999a). In determining stand density versus marketable yield per acre, producers need to establish the market link to size and value to determine the impact on profitability (Duthie et al.1999b). When the size and value are not affected by stand density, producers should increase plant density (Duthie et al.1999a).

Researchers have examined mulch and row covers extensively to determine their application's impact on watermelon production (McCraw and Motes). An Oklahoma State Unieversity extension report by McCraw and Motes recommended the best color of different mulches as well as their best time for application. The report also shows the impact of mulches on the health of plants, weed control, and reduced fertilizer leaching (McCraw and Motes). Improved quality, soil moisture regulation, reduced soil compaction, and reduced root pruning occurred because of the different types of mulches (McCraw and Motes). The Oklahoma State University report also indicated that mulches increased yields and increased costs (McCraw and Motes).

Row covers contribute to earlier harvest and wind protection when planting watermelons early (McCraw and Motes). When combined, row covers and mulches increased yield, allowed an earlier harvesting date, and resulted in larger fruit (Soltani, Anderson, and Hamson, 1995).

One square meter is the optimum planting space for large fruit when using drip-irrigation and plastic mulch systems (Sanders, Cure, and Schulthesis, 1999). Increased

density of plant spacing had a greater effect on larger watermelon varieties than on smaller varieties (Sanders, Cure, and Schulthesis, 1999). Using poultry litter as fertilizer on a legume winter cover crop followed by planting watermelon increased watermelon production in conjunction with plastic mulch usage. This result is particularly important because the cover crop helps reduce the amount of phosphorus left in the soil from the poultry litter (Baker et al., 1998). This reduction in phosphorus is important because watermelon production usually does not use up phosphorus as quickly as nitrogen.

Triploid watermelon plants, also known, as seedless watermelons do not have viable seed as diploid watermelons have (Marr and Tisserat). Pollination of triploid watermelon flowers depends on the frequency of bee pollination to the female stigma (Bolin et al.). Triploid varieties, although more difficult to produce and reproduce, are preferred by consumers due to their seedless nature.

Researchers have done previous Oklahoma watermelon cost-benefit analyses. With the new technologies and cost changes, the producers need to reevaluate the estimations. There were 22,000 acres with an average of 18,000 lbs per acre yield in Oklahoma in 2001 with a farm value of 23.8 million dollars (Bolin et al.). This acerage is a 284% increase in acres grown to watermelons since 1997. This large increase in watermelon production could be due to an increased number of new varieties adapted for growth in Oklahoma.

Producers typically grow watermelons on "sandy loam, sand, or silt loam soils with a pH of 6.5 to 7 (Bolin et al., p 16)." Any deviation from this range increases the possibilities of disease problems. Rainfall or irrigation amounts are important to

watermelon production since inadequate amounts result in lopsided or smaller fruit and excess amounts result in diseases and rot.

Management systems are another issue that producers should study before engaging in watermelon production. Low intensity and high intensity management systems are two types of production practices that can greatly affect cost, yields, time requirements, and profits. The importance of deciding between high intensity and low intensity management for production has greatly increased as the size of watermelon acreage per producer has increased. "Low intensity management included only soil fertilization and weed control (Lu et al., 2002, p 2)." "High intensity management involved additionally plastic mulch, drip irrigation, insect control, and plant disease control (Lu et al., 2002, p 2)." High intensity management has increased producer involvement in the planning of irrigation rates and timing. It also has affected the use of pest controls and their timing of application as well as determining the value and need of applying mulch. These intense management practices have led to increased returns over low intensity management. High yield difference and market prices contributed to high net returns that compensated for the additional cost of high-intensity management compared to low-intensity management (Lu et al., 2002). Producers that establish which management practice they plan to implement have the advantage of being able to determine the cost and benefit of using each added management practice. This plan helps create a more accurate picture of expected returns.

Cost-benefit analysis

Producers can use a cost-benefit analysis to estimate potential for profitability. In addition, it allows existing and potential producers the ability to analyze the profitability of expansion or diversification with watermelons. Producers can estimate profits using the type of watermelon variety currently grown. For example, the producer can make a comparison between the expected net return from an open pollinated seeded watermelon against the possibility of selecting a triploid hybrid seedless watermelon for expanding a producer's watermelon enterprise. The costs attributed to these changes can take the form of variable and fixed costs when conducting a cost benefit analysis.

Cost-benefit analysis is a normative economic study of the welfare change due to possible changes in actions or production decisions. The solution may signify a reduction or expansion in production, an entry into production, or a withdrawal or continued omission from production.

A cost-benefit analysis faces many challenges and has many aspects. "The most important aspect of a cost-benefit analysis is the identification of all the relevant costs and benefits (Sassone and Schaffer, 1978, p.43)." The next aspect of importance is the quantification of the costs and benefits (Sassone and Schaffer, 1978). Each analysis has state 1, the current state, and state 2, the optimal state for the producer given their constraints. The variation between state 1 and state 2 gives the producer the quantitative information necessary to facilitate an alteration decision.

A printed cost-benefit analysis may aid readers in grasping the intricacies of watermelon budgets. Table 1 is an example budget of average costs and benefits for one

acre of irrigated, seedless watermelons in the state of Oklahoma. (We reproduced Table 1 from Bolin et al., p.84) Table 2 is an example budget of average costs and benefits for one acre of dryland, seeded watermelons in the state of Oklahoma. (We reproduced Table 2 from Bolin et al., p.85) Each section is labeled according to expected cultural practice, amount to be applied and its respective cost per acre. The section labeled "Your Farm" is for farmers to input their individual data to compare it with statewide average costs and levels of inputs.

Choice of variety affects benefits because yield and market value differ by variety. In the watermelon production case the benefits gained from a specific variety must at the least offset the costs of using the variety. In addition, producers can determine benefits based on which variety is low cost and low labor intensive. If producers want low cost and low labor requiring varieties, but the most profit, they can pick from the varieties that meet their marketing specifications. If they have other desires, they can pick the variety that best suites those desires and is the most profitable.

Henneberry and Kang found that market sales point and market price have a large impact on revenues (Henneberry and Kang, 1992). They focused on which wholesale market provided the highest return on crops in terms of selling price and marketing window. They also showed possible trends that growers had in direct marketing preferences. The market sales point and price is important because Oklahoma is unique in that it has three terminal markets within close proximities to choose from when marketing their harvest. The study considered only the Dallas and Denver markets but determined that the Denver market on average offered the best price and the largest market window for Oklahoma watermelons. Bolin et al. discussed market prices and

their impact on profit and showed how price changes affected the profit. These studies showed how important harvest time or hitting the right market window is in making a profit in the watermelon industry.

Eighty five percent of total costs are the variable input costs (Schatzer & Motes). Some of the costs indicated as variable costs are pesticides, seeds, fertilizers, labor, and repair expenses (Schatzer & Motes). Additional variable costs are items such as mulches and row covers.

In previous watermelon production research, examples of fixed costs were associated with the use of tractor and irrigation equipment. Depreciation on these assets is included as fixed cost expenditures (Schatzer & Motes). Schatzer and Motes indicate that fixed costs account for roughly one seventh of the total cost of inputs excluding land costs (Schatzer & Motes).

Background

Bolin et. al provided a comprehensive list of the average cultural practices used in watermelon production which we reproduced in Tables 1 and 2.

The cost/benefit analyses in this study contain two sets of estimates. The first is a baseline set of costs and returns for each of the selected watermelon varieties using the seeding rates and expected yields provided by the respective seed companies. The market price used is a ten-year national average market price of $0.0689 for the seeded varieties and $0.11 per pound for the seedless varieties (USDA, Table 62-U.S. watermelons).

The second set of estimates is comprised of data taken from a statewide survey of Oklahoma watermelon producers in 1999. Triploid seeds produce fruit desired more by consumers, but cost more than diploid seed. Management has a large impact on the variable cost amount. More intense management practices increase variable costs especially through labor, mulch, and row covers. The more intense management practices generally are more costly, but are usually more profitable than their less intense counterparts.

Irrigation techniques include flood (or gravity), sprinkler, drip, and trickle irrigation. Sprinkler irrigation is the most common form of irrigation technology used in Oklahoma (Pier &Doerge,1995).

With center pivot irrigation systems that are not using low energy precision application (LEPA), there is difficulty in calculating accurately the percent of the application that actually makes it to the plant and the ground. High winds in Oklahoma vary and make accurate calculation of the amount of water accurately received by the plants almost impossible. Trickle irrigation is another method receiving increasing attention. Pier and Doerge state that "subsurface trickle irrigation has many advantages over conventional methods of surface irrigation used in melon production...these include greater irrigation efficiency, reduced drainage water volume, and improved nitrogen application efficiency (Pier & Doerge, 1995, p 1)." Each irrigation system has positive and negative aspects. The conventional methods are usually less costly and easier to manage. The newer, more complicated methods are usually more expensive and require more management. Depending on personal preferences and cost constraints, the irrigation method is one of the most important and difficult decisions to make.

Table 1. Watermelon costs and returns Oklahoma - Seedless - Irrigated

Revenue From Watermelon Sales	Per Acre Estimates						Your Farm
Watermelon Sales Seedless Tri-X 313	20,000	Lbs		0.1000	per lb	$2,000.00	
Expenses							
Pre-Plant							
Plow (Moldboard)	1	appl		10.00	per app	10.00	
Disk	2	appl		10.00	per app	20.00	
Bed	1	appl		4.00	per app	4.00	
Bed Shaper	1	appl		4.00	per app	4.00	
Plastic Mulch - 9' rows, (Apply & Remove)	1	appl		90.00	per appl	90.00	
Insect Control (Squash Bugs)	1	appl		10.00	per appl	10.00	
Weed Control (Pigweed)	1	appl	1.5 pt/acre	4.05	per pt	6.08	
Fertilizer	150	lb		0.1150	per lb	17.25	
Total Pre-plant						$161.33	
Growing Season							
Wind Breaks Planted	1	acre		20.00	per acre	20.00	
Transplant	1,452	plants/acre		0.28	per plant	406.56	
Transplant Labor	1,452	plants/acre		0.08	per plant	116.16	
Insect Ctrl (Cucumber Beetle, Aphids)	1	appl		10.00	per app	10.00	
Irrigation	2	appl (4 in)		12.50	per app	25.00	
Bee Hives Rent (1 hive/2 1/2 acres)	0.4	hive/acre		25.00	per hive	10.00	
Labor (Cultivation, Irrigation & Tractor)	1	acre		40.00	per acre	40.00	
Fertilizer	30	lb		0.1150	per lb	3.45	
Disease (Fungi)	1	acre		45.00	per acre	45.00	
Insect Control (Aphids & Squash Bugs)	2	appl		7.50	per appl	15.00	
Weed Control (Hoe)	2	appl		50.00	per acre	100.00	
Total Growing Expenses						$791.17	
Total Pre-plant and Growing Costs (Per Acre)						$952.50	
Harvest and Marketing Expenses							
Harvest Expense	20,000	Lb		0.010	per lb	200.00	
Shed, Packing, & Marketing Expense	20,000	Lb		0.015	per lb	300.00	
BREAKEVEN PRICE to Cover Harvest Costs				0.025	per lb		
Total Harvest & Marketing Expense						$500.00	
Interest on Operating Money (8.75% 4 mos)				2.9167%		$42.36	
Total Pre-plant, Growing, Harvest & Marketing, and Interest Costs (Variable Costs)						$1,494.86	
Return Above Variable Costs						$505.14	
Breakeven Price to Cover Pre-plant, Growing, Harvest & Marketing Costs (Variable Costs)					$0.075	per lb	
Fixed Costs							
Liability Insurance	1	acre		2.00	per acre	2.00	
Land Charge	1	acre		100.00	per acre	100.00	
Total Fixed Costs						$102.00	
Total Costs Per Acre						$1,596.86	
Revenue Above Total Costs (Per Acre)						$403.14	
BREAKEVEN PRICE to Cover ALL COSTS			$0.0798 per lb				

Table 2. Watermelon costs and returns Oklahoma - Seeded – Dryland

Revenue From Watermelon Sales	*Per Acre Estimates*					*Your Farm*
Watermelon Sales - Black Diamond	18,000	Lbs		0.0575	per lb	$1,035.00
Expenses						
Pre-Plant						
Plow (Moldboard)	1	appl		10.00	per app	$10.00
Disk	1	appl		6.00	per app	6.00
Bed (none)	0	appl		4.00	per app	0.00
Bed Shaper	0	appl		4.00	per app	0.00
Weed Control	1	appl	0.75 qt/acre	9.59	per qt	7.19
Fertilizer	150	lb		0.1150	per lb	17.25
Total Pre-Plant Expenses						$40.44
Growing Season						
Wind Breaks Planted (none)	0	acre		0.00	per acre	$0.00
Seed (Black Diamond)	0.15	lb/acre		150.00	per/ lb	22.50
Plant (May 10)	1	acre		16.00	per acre	16.00
Insect Ctrl (Cucumber Beetle, Aphids)	1	appl		10.00	per app	10.00
Bee Hives Rent (1 hive/2 1/2 acres)	0	hive/acre		25.00	per hive	0.00
Fertilizer	0	lb		0.1150	per lb	0.00
Disease (Anthracnose)	3	appl		6.68	per appl	20.04
Insect Control (Aphids & Squash Bugs)	2	appl		3.12	per appl	6.24
Weed Control (Hoeing)	2	appl		50.00	per acre	100.00
Cultivation	1	appl		12.00	per acre	12.00
Labor (Cultivation, Irrigation & Tractor)	1	acre		40.00	per acre	40.00
Irrigation (none)	0					
Rainfall (average)	0.761	inches				
Total Growing Expenses						$226.78
Total Pre-plant and Growing Costs (Per Acre)						$267.22
Harvest and Marketing Expenses						
Harvest & Marketing Expense	18,000	Lb	0.015 per lb			$270.00
BREAKEVEN PRICE to Cover Harvest Costs			0.015 per lb			
Interest on Operating Money (8.75%-4mos)			2.9167%			15.67
Total Pre-plant, Growing, Harvest & Marketing, and Interest Costs (Variable Costs)						$552.89
Return Above Variable Costs						$482.11
Breakeven Price to Cover Pre-plant, Growing, Harvest and Marketing, and Interest costs (Variable costs)						$0.0307
Fixed Costs						
Liability Insurance	1	acre		2.00	per acre	$2.00
Land Charge	1	acre		75.00	per acre	75.00
Total Fixed Costs						$77.00
Total Costs Per Acre						$629.89
Revenue Above Total Costs (Per Acre)						$405.11
BREAKEVEN PRICE to Cover ALL COSTS			$0.0350 per lb			

Mulches may increase soil temperature, and reduce weed problems, allow earlier planting, and thus result in fruit that the producer can market earlier (McCraw & Motes). Mulches come in a variety of organic and non-organic types. The organic are more expensive, but the producer can plow them directly back into the soil. The non-organic types, especially the plastic mulches, are less expensive and easier to use, but the producer has to remove and dispose of it after the growing season. Row covers aid in the fight against pests, but producers use them mainly in early planting of crops as protection from frost (McCraw & Motes).

Researchers have suggested the use of alternative fertilizers such as poultry litter to aid in the retention of nitrogen and balance in the soil (Baker et al., 1998). Mulches, row covers, and irrigation along with the alternative fertilizers can be costly, but very beneficial in overall yield and marketable fruit. These inputs are also beneficial for their ability to control various diseases that are damaging to profits and yield.

Using the benefits and costs discussed in this chapter in a cost-benefit analysis can provide several financial measures important to producers. Return rates and ratios are the basis for determining whether to invest and produce watermelons or to choose another activity of production.

We inserted an Integrated Farm Financial Statements (IFFS) into the budget tool to help producers develop their individual financial reports. From this link, the producers can estimate returns on assets with a little extra work along with return on equity. These two figures when compared to other production activity return rates will allow potential

producers the ability to evaluate their production decisions. The asset to debt ratio and the asset to equity ratio also aid in determining financial viability and risk.

In this study, we base the cost-benefit analyses on the assumption that watermelon is the only enterprise on the producers land and that any cost associated with unused equipment, labor, etc. are ignored. Based on the cost-benefit analysis, producers or potential producers can better determine what inputs are required and what returns they can expect. The establishment of a more specific cost-benefit analysis for Oklahoma watermelon production provides a more detailed and specific look at the Oklahoma market. Because of the specialized equipment required to grow watermelons, producers must consider the additional cost of it when comparing with other agriculture and non-agriculture production activities. These analyses should be able to help provide the producer with the appropriate information to make the correct decision for their watermelon enterprise. The computerized budgeting system developed will have the ability to present these financial data directly to the producer or user.

CHAPTER 3

ANALYSIS

Farmers have many variables to take into consideration when estimating a cost benefit analysis. Some of these variables are soil type, location, whether or not to use irrigation, type of variety to plant, value of the crop at time of sale, and amount of seed to use during planting.

Survey

Scientists from Wes Watkins Agricultural Research and Extension Center (WWAREC) at Lane, Oklahoma conducted a statewide survey in 1999 of watermelon producers in Oklahoma. The survey included 66 growers that were representative of the range of cultural practices and farm sizes in the four regions of the state. The information collected included state region, longitude and latitude of plot, acres in production, cultivars planted, planting time, and the time of season planted (early, mid, late), the bed width and height, row spacing, usage of black plastic mulch, the direction the grower planted the field (e.g. orientation of rows east-west or north-south), fertilization practices and amounts used, the type of irrigation, beehive presence, rotation of previous crops on the particular field, the use of windbreaks, harvest dates seeding rates, and experience of the producer.

These variables were extremely important in making decisions as to which variables to hold constant in our analysis. The survey collected marketable yield count with the results indicating differences in yield based on variety. The growers for seeded diploid and hybrid varieties provided seeding rates in pounds of seed per acre. For triploid hybrid seedless watermelons, we made the assumption that there were 2,400 plants per acre. This assumption allowed an estimate of profit per acre for seedless watermelon. We did not use most information from the survey in our cost-benefit analysis.

Data, Methods, and Procedures

The data analysis began with deleting the incomplete survey observations. Examples of observations deleted were surveys with unknown seeding rates and unknown marketable fruit counts.

Most producers sow the seedless varieties as transplants either by hand or with special transplanting equipment. In the survey, the seed category was listed as not applicable. We created a seed planted per acre table based on the recommended seeding rate by the companies who sell the seeds. This table allowed for an accurate calculation of cost for the seedless varieties.

At the end of the growing season the survey had a marketable yield count that was taken weekly from the test sites. Survey takers determine the marketable yield counts by documenting three 100-meter counts randomly from each field. We converted these counts into estimated yields. Equation 1 shows how we converted these counts into yield estimates. First, we averaged the three one hundred meter samples from the field. Next,

we divided the average marketable yield count by one hundred meters converting the data to yield per meter. We then multiplied the marketable yield count in terms of meters by .3084 meters to convert the data to marketable fruit per foot. We divided the marketable fruit by the row spacing to convert the data to marketable fruit per square foot. Then we multiplied the marketable fruit per square foot by 43,560 square feet to convert the data to marketable fruit per acre and multiplied this number by the average weight of the watermelon variety grown in the field. We then had an estimated yield in lbs. per acre.

$$(1)\ \frac{marketable fruit}{100m} \bullet \frac{.3048m}{1\,ft} \bullet \frac{1}{row spacing\,ft} \bullet \frac{43{,}560\,ft^2}{1\,acre} = \frac{marketable fruit}{1\,acre} \bullet avg.\,weight lbs. = \frac{lbs}{acre}$$

Average weights for the marketable varieties for the base analysis were dependent upon the variety and time of harvest. The base analysis were run for dryland and irrigated scenarios, recommended seeding rate, and estimated yield for the varieties holding all other variables constant. We obtained data from Dewitt Seed Company on seed varieties, recommended seeding rate and expected average weight per melon (Table 4). These data were used to calculate the average weight of each variety of watermelon for a given harvest interval. We used these values to estimate the gross income from marketable fruit sold for each observation.

Table 3. Watermelon Varieties and Their Average Weights Per Melon

Variety	Average weight	Seeding Rates
Royal sweet	20-25	5
Starbrite	22-31	5
Sangria	22-26	5
Tri-x313	15-18	2400[1]
Sunsweet	18-22	5
Orange glows	22-28	5
Black diamond	30-45	5
Allsweet	25-30	5
Juliettes	25-32	5
Desert king	16-22	5
Mardigras	24-30	5
Crimson long	22-27	5
Royal flush	28-32	5
Legacy	22-25	5
Jubalee	26-34	5
Fandango	25-35	2400[1]
Sugartime	15-21	2400[1]
Stars n stripes	22-30	5
Pinnata	22-25	5

[1] Number of plants per acre

Provided by Dewitt Seed Company

The market price we used to analyze these data was a ten year average of yearly U.S. watermelons prices from 1989 to 1999 (Figure 1). The average for the ten years was $.0697 per pound of watermelon produced. For the seedless triploid hybrids an estimated average market price of .11 cents per pound was used (Taylor, 2003).

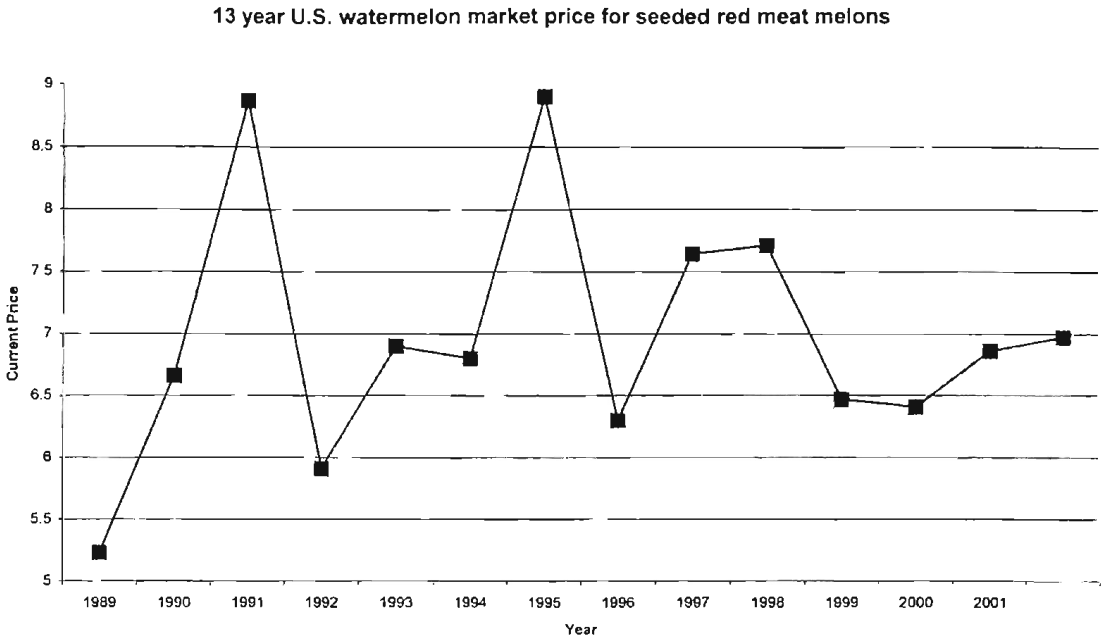

Figure 1. Watermelon Market Price

We used the procedures previously discussed to develop a watermelon budget spreadsheet for the Oklahoma State University (OSU) Budgeting software to estimate profits/acre.

> "The OSU Enterprise Budget software is designed to facilitate the development of budgets that are appropriate to a geographic region. Users are allowed to override defaults with their own values to totally customize the budget if their experience and farm records indicate different values and production practices. Our intent is to provide software that is flexible and user-friendly, with default values that are reasonable for items that are difficult to calculate, for example, per acre machinery costs for a specific crop. Additionally, the software is to serve an educational tool and resource. Links to many references are provided, such as OSU fact sheets and current reports, Oklahoma Agricultural Statistics Service data, and, in some cases, expert opinion. Where possible, web-links are built into the spreadsheets to provide users who have Internet access direct links." (Doye, Sahs, Kletke, and Hardin, 2001, p. 1)

To use the software, users must understand some basics behind Microsoft Excel spreadsheets and have Excel 97 or higher on their computer. Each individual budget

consists of multiple worksheets within one Excel workbook (Doye, Sahs, Kletke, and Hardin, 2001).

We used a base yield of 16,000 lbs per acre for dryland watermelons and 20,000 pounds per acre for irrigated watermelons. In the budgeting software, these yields are only considered averages and the grower has the option to adjust these estimated yields.

Dewitt Seed Company provided average statewide seeding rates. Open pollinated seeded watermelons had a suggested seeding rate of 5 lbs. per acre. Diploid Hybrid seeded varieties also had suggested seeding rates of 5 lbs per acre. Triploid Hybrid seedless watermelons had a suggested seeding rate of 2,400 plants per acre.

We inserted a layer within the budget software titled Other Inc. to allow growers who receive crop subsidies, oil and gas royalties, or other payment for use of their land other than the direct payment for the sale of their harvested crop. We included machinery and irrigation cost for using a small (40hp) and a medium (95hp) horsepower tractor. We decided to calculate machinery cost for our analysis based on owning the machinery instead of custom hiring the work to be completed. The computerized budget software has three machinery cost choices for calculating the cost (OSU Enterprise Budget Software). You can choose own machinery, custom machinery, or a combination of own and custom. It also allows you to choose which pieces of machinery you own and which you plan to custom hire.

We calculated all chemical applications using the recommended minimum applications of fungicides, insecticides, and herbicides. Our analysis is based on three applications of fungicides and two applications each of insecticides and herbicides.

We used fertilizer application prices from the USDA's annual price estimates for the region. We based out analysis on the uses of fertilizer As reported in the Cucurbit Integrated crop management guide provided by the Oklahoma Cooperative Extension Service (Table 5). We assumed that the soil test was adequate for potassium and phosphorus. We assumed no nitrogen available in the soil test. We applied a pre-plant application of 150 pounds of ammonium nitrate, which is equivalent to 51 lbs of Nitrogen. We added an additional 150 pounds of ammonium nitrate three to four weeks after plant emergence.

Table 4. The Following Amounts of P2O5 and K2O are Recommended Based on OSU Soil Test Results

P2O5 per acre for Watermelon					
Test shows	0-19	20-39	40-69	70-99	100+
Add lbs P2O5/acre	100	75	50	25	0

K2O per acre for Watermelon					
Test shows	0-99	100-149	150-199	200-249	250+
Add lbs K2O /acre	250	150	100	50	0

Hired labor is a very important part of watermelon production since it is so labor intensive. We used a hired labor wage of $7.50 per hour for all hoeing, pruning, and any additional harvest labor used.

We created a layer titled Harvest in the budgeting software to allow growers who pay all of their harvesting costs by the job or by the piece to input it this way. This layer allows them to not need to account for the number of workers or the number of hours required for harvest, but just simply to calculate the total cost of harvesting the crop. Within this layer there is also a default price for packing, storing, and marketing watermelons. We based these prices on past budgets created for watermelon production.

An example would be the added cost of selling your crop through a broker. Since not all producers use a broker this cost would need to be added by the grower.

The Irrigation layer was created with four optional irrigation types Side roll, center pivot with 15 psi drops nozzles, 30 psi impact nozzles, and low drift nozzles. Fuel type used to run the irrigation system has diesel, propane, electric, and natural gas as options to choose from. All of the irrigation system types have default cost structures.

A Parameter layer contains many of the default costs used within the budget. Optional changes on the Parameter layer are fuel price paid for diesel, typical wage rate paid, and operating capital interest rates. Machinery related areas are on this layer. They are percent paid in taxes on machinery purchase price, percent insurance on machinery value, and interest rate charged on machinery loans. Annual capital month or anticipated harvest month is an extremely important area on this layer. Directly related to the harvest month is the amount of interest incurred on operating loans for the watermelon enterprise.

To complete our data collection we calculated land taxes. We again took these estimates from past budgets in which land taxes were previously calculated. We incorporated a layer titled Other expenses for producers to add any additional costs they may have incurred based on the growing or selling of their crop. The use of beehives would be example of an Other Expense. Some areas have strong native bee populations to help with pollination. Other areas within the state need to introduce beehives to insure pollination will occur. Average costs of establishing beehives on a per acre basis are within the budget. The default costs exist if a grower chooses to incur these costs.

One of the benefits of creating a computerized budgeting system was the ability to obtain sensitivity reports from the inputs used in the budgeting system. Based upon the

data entered into the budgeting system the producer can obtain many different financial reports. An Integrated Farm Financial Statements (IFFS) link is provided so the budget data could be exported for financial and whole farm analysis. Other links included break-even analysis and sensitivity analysis. Producers can use IFFS to quickly and accurately determine their financial standings when using certain amounts of inputs and receiving a specified output.

CHAPTER 4

RESULTS

We began the analyses by estimating a base profit per acre output for each variety using the recommended seeding rate for each variety. We then found the cost of seed on a per pound basis for the open pollinated (seeded) varieties and on a per thousand seed basis for the diploid hybrid (seeded) and triploid hybrid (seedless) watermelons (see Table 5.). After the recommended seeding rates were entered for each variety along with the seed cost we established yield estimations based on irrigation or non-irrigation practices. We assumed irrigated watermelons had an average yield of 20,000 pounds per acre and dryland watermelons had an average of 16,000 pounds per acre. We then used the budgeting tool to calculate a base profit per acre for each variety. With irrigation and seeding rate being held constant along with all other inputs the factor that affected each variety's profit per acre was the initial seed cost of growing that variety. We ran the initial analysis for both dryland and irrigated practices using the assumed yields and the recommended seeding rate.

Table 5. Watermelon Seed Prices by the Pound or by Thousand Seeds

Variety	Prices/lb or M
Allsweet	$18.00/lb.
Black Diamond	$10.00/lb.
Crimson Sweet	$13.00/lb.
Desert King	$11.00/lb.
Jubileee	$10.00/lb.
Juliette	$28.50/lb.
Legacy	$29.50/lb.
Verona	$11.00/lb.
Royal Sweet	$34.10/M
Royal Flush	$38.70/M
Sangria	$36.85/M
Starbrite	$31.50/M
Sugar Time	$110.00/M

Provided by Dewitt Seed Company
M/1000 seeds

The next step was to estimate the cost/benefits using producer's values from the survey for each variety. We modified the base analysis with the survey results. We used the reported irrigation practices, yield estimates, and seeding rate to calculate for each observation within the survey to obtain an estimate of the producer's profit per acre assuming all other practices were the same as the base analysis.

Analytical Results

Table 6 provides the results of the base analysis for each variety for dryland and irrigated production. The only difference between the budgets for each variety was the price of the seed and the price of the watermelons. Seedless watermelons varieties had a

higher selling price than seeded watermelons. The seeded varieties had a range of estimated profits from $237 to $336 per acre for dryland production and from $340 to $439 per acre for irrigated production. The seedless variety had a profit of $553 per acre dryland and $776 per acre irrigated.

Table 6. Watermelon Variety Profits Per Acre Comparisons

Variety	Dryland $Profit/acre	Irrigated $Profit/acre
Allsweet	296	398
Black Diamond	336	439
Desert King	331	434
Jubilee	336	439
Juliett	242	345
Crimson Sweet	321	423
Verona	331	434
Legacy	237	340
Sugar Time[1]	553	776

[1]Sugar Time is a seedless variety so it has a higher market price per pound.

Survey Results

In the survey most varieties in Oklahoma had a higher estimated yield that the base assumptions and therefore exceeded the estimated base profits per acre. The survey data showed many varieties grown in Oklahoma. Table 7 reports the estimated average profit per acre by variety and irrigation type for the survey results.

Allsweet

The average profits per acre of the seven survey observations for the Allsweet yielded an estimated average profit of $562 per acre. After taking the average of the two observations of non-irrigated Allsweet watermelons, we found an average profit of $214 per acre. The dryland profit is smaller when compared to the irrigated observations, which should be expected.

Table 7. Statewide Avg. Profit Per Acre of Each Watermelon Variety Given Irrigation Use

Variety and Irrigation Method	Avg.profit/acre	Number of Observations
AllSweet Irrigated	$562/acre	7 obs.
AllSweet Non-irrigated	$214/acre	3 obs.
Black Diamond Irrigated	$ - 89/acre	2 obs.
Black Diamond Non-irrigated	$887/acre	6 obs.
Sugar Time Irrigated	$2,447/acre	6 obs.
Crimson Sweet Non-irrigated	$ 35/acre	3 obs.
Desert King Non-irrigated	$234/acre	2 obs.

Black Diamond

Next we analyzed the Black Diamond variety in a non-irrigated scenario. We had six observations from the survey with seeding rates between five and fifteen pounds per acre. We estimated the Black Diamond variety averaged a profit of $887 per acre. This average for the surveyed observations of Black Diamond watermelons exceeded our base scenario for non-irrigated Black Diamond watermelons by $336 profit per acre. However, the irrigated Black Diamond watermelons survey observations failed to meet the estimated base profits per acre by more than $500 per acre. Our estimate of the survey observation actually showed a loss on average when growing Black Diamond watermelons under irrigated conditions. This result is due to the low estimated yields for the two survey observations.

Crimson Sweet

We estimated that the survey observations for Crimson Sweet on average yielded lower than expected profits per acre. In a non-irrigated situation, the three-survey observations for this variety yielded an estimated average profit of $35. These average

profits fell below the estimated dryland Crimson Sweet base analysis profits of $321. The Crimson Sweet survey observations had low yields per acre.

Desert King

The two survey observations for the Desert King variety produced and estimated average profit of $234 per acre for dryland watermelon production. The average profit of $234 fell just shy of the estimated base profits for dryland Desert King melons.

Triploid Hybrids

Sugar Time

The six survey observations for the Sugar Time variety provided an average estimated profit per acre of $2,447 when irrigated. This result was much higher then the base model averages. The estimated yields for the survey observations were much higher on a per acre basis than both the open pollinated and the diploid hybrids and our base assumptions.

Summary of Results

In comparing the results, in an irrigated situation the Black Diamond variety seems to not show a yield increase to water like other newer varieties. This result may be due to the fact that the Black Diamond was originally selected for its ability to produce in water stress situations and therefore does not respond as well to increases in water availability. Using the budgeting spreadsheet we found that for the survey observations Allsweet produced the largest profit per acre of the open pollinated varieties in an irrigated situation. In a non-irrigated scenario, the Black Diamond and the Allsweet variety had high positive profits.

The survey had six Sugar Time observations all of which were irrigated. The seeding rates were based on a plant per acre rate of 2400. Due to the requirement of transplanting the triploids a plant rate of 2400 seeds is equivalent to exactly 2400 seeds per acre. The survey yields far exceeded the base models estimates resulting in extremely high returns on the per acre bases.

CHAPTER 5

CONCLUSIONS AND RECOMMENDATIONS

Conclusions

Choosing a watermelon variety in Oklahoma can be difficult. Determining whether or not to use irrigation practices on watermelons will influence which variety you chose. The budgeting tool developed by this project may serve as a basis for future research in watermelon production.

For lenders, the decision as to which producers they should provide with the capital needed to grow watermelons is difficult. The Oklahoma watermelon budgeting spreadsheet is a tool that will help lenders make these determinations.

Brokers play a large role in the decisions farmers make on which cultivar to grow. With this budget tool, it is possible for brokers to assist farmers in making decisions as to the best cultivar they can grow.

For new growers this budget tool may help them decide if they want to grow watermelons and when given options by the broker on which cultivar they need to grow. This tool may help them decide if it is still profitable to them to grow watermelons and choose cultivars.

In general, watermelon growers need an accurate budgeting tool to assist them in making production decisions. This interactive budgeting spreadsheet allows the producers to make small adjustments to future watermelon planting plans at the computer without

having to go through the expense of trial and error production. In addition, this budgeting tool provides watermelon growers a method of estimating financial ratios as well as business returns without having to reenter data scenarios in another program or calculate them on paper.

Recommendations

We recommend that new watermelon producers use a budgeting spreadsheet before beginning production. For existing watermelon producers the use of a budgeting spreadsheet allows them to compare current profits with that of the average Oklahoma watermelon producer with similar inputs. This budgeting spreadsheet provides growers a convenient method of estimating their business returns, financial ratios, and other desired accounting calculations.

Based on calculations resulting from development of this budget tool, we recommend that researchers conduct more studies to estimate the benefit of seedless cultivars in comparison with seeded hybrid and open pollinated cultivars. We believe that this research will greatly effect the recommendations for growing seedless cultivars in Oklahoma.

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APPENDIX

OKLAHOMA WATERMELON ENTERPRISE BUDGETS

Table 8. Dryland, Allsweet Enterprise Budget

Dryland Watermelon Enterprise Budget
40 acres farmed.

OSU
OKLAHOMA COOPERATIVE EXTENSION SERVICE

Name
Farm Description

					Total
PRODUCTION	**Units**	**Price**	**Quantity**		**$/Acre**
Watermelon	Pound	$ 0.07	16000	$	1,120.00
Other Income	Acre	$ -	0	$	-
Total Receipts				**$**	**1,120.00**
OPERATING INPUTS	**Units**	**Price**	**Quantity**		**$/Acre**
Watermelon Seed	lbs/acre	$ 18.00	5.00	$	90.00
Fertilizer	Acre	$ 28.05	1	$	28.05
Disease Control	Acre	$ 147.61	1	$	147.61
Insect Control	Acre	$ 48.33	1	$	48.33
Weed Control	Acre	$ 26.94	1	$	26.94
Crop Insurance	Acre	$ -	0	$	-
Staking Labor	Hrs.	$ -	0	$	-
Tieing Labor	Hrs.	$ -	0	$	-
Hoeing Labor	Hrs.	$ 7.50	9	$	67.50
Pruning Labor	Hrs.	$ 7.50	4	$	30.00
Harvesting Labor	Hrs.	$ 7.50	0	$	-
Marketing and Grading	Acre	$ 240.00	1	$	240.00
Annual Operating Capital	Dollars	6.75%	83.18	$	5.61
Machinery Labor	Hrs.	$ 7.50	3.78	$	28.35
Custom Hire	Acre	$ 14.00	1	$	14.00
Machinery Fuel, Lube, Repairs	Acre	$ 24.07	1	$	24.07
Other Expense	Acre	$ 25.00	1	$	25.00
Total Operating Costs				**$**	**775.46**
Returns Above Total Operating Costs				**$**	**344.54**
FIXED COSTS	**Units**	**Rate**			**$/Acre**
Machinery/Irrigation	$/value				
Interest at	Dollars	6.50%		$	15.17
Taxes at	Dollars	1.00%		$	3.77
Insurance	Dollars	0.60%		$	1.40
Depreciation	Dollars			$	28.65
Land	$/acre	$ -			
Interest at	Dollars	0.00%		$	-
Taxes at	Dollars	0.00%		$	-
Total Fixed Costs				**$**	**48.99**
Total Costs (Operating + Fixed)				**$**	**824.45**
Returns Above All Specified Costs				**$**	**295.55**

Canadian County - North-Central OK
Owned field - harvest equipment
Owner-Operator
Used machinery complement

Break-Even (B-E) Analysis				
B-E Yield at $/lb.	**0.07**	**B-E Price at lbs./acre**		**16000**
Above Operating Costs (Lbs.)	11078	Above Operating Costs	$	0.048
Above Total Costs (Lbs.)	11778	Above Total Costs	$	0.052

Table 9. Dryland, Allsweet Yield Layer

Month of Sale	Percent Of Sale	Sale Price by Month	Avg Price for sales	Annual Base	Avg Price for sales	User Spec Price
January	0	$ 6.99	$ -	100.0%	$ 6.99	$6.99
February	0	$ 6.99	$ -	100.0%	$ 6.99	$6.99
March	0	$ 6.99	$ -	100.0%	$ 6.99	$6.99
April	0	$ 6.99	$ -	100.0%	$ 6.99	$6.99
May	0	$ 6.99	$ -	100.0%	$ 6.99	$6.99
June	0	$ 6.99	$ -	100.0%	$ 6.99	$6.99
July	100	$ 6.99	$ 6.99	100.0%	$ 6.99	$6.99
August	0	$ 6.99	$ -	100.0%	$ 6.99	$6.99
September	0	$ 6.99	$ -	100.0%	$ 6.99	$6.99
October	0	$ 6.99	$ -	100.0%	$ 6.99	$6.99
November	0	$ 6.99	$ -	100.0%	$ 6.99	$6.99
December	0	$ 6.99	$ -	100.0%	$ 6.99	$6.99
		Wght. Avg	6.99			$6.99
		Oct price	$ 6.99			6.99

Share of Crop Received:	100%
Share amount to use:	100%

Table 10. Dryland, Allsweet Other Income Layer

Specify any other income not accounted for in other sections. Include a description, the month the income will be received, and the income per acre. Use the first two lines for government payments.

Other Income	Month of Income	Income per Acre
Direct Payment		
Counter-Cyclical Payment		
Total Other Income:		$ -

Table 11. Dryland, Allsweet Seed Cost, Seeding Rate, and Planting Date Layer

You can specify the variety, seeding rate, price of seed, and planting date for your enterprise, or use the default values. Irrigation recommendations and disease resistance can be viewed by clicking the More Information

Seeding Rate	Area	lbs/acre Planted	Seed Cost $/acre	Planting Date
Default	State	5.00	$ 18.00	4/1/02
Your Value				

revise "More Info" for melons if warranted.

Table 12. Dryland, Allsweet Marketing and Harvesting Expense Layer

Post-Harvest Expense - Listed below are costs for post-harvest watermelons. You can use the defaults specified or make adjustments in the "Your Value" column.

Post-Harvest Expense	Default	Your Value	Month of Expense	Cost Per Acre
Marketing/Grading per Pound	$ 0.015	$ 0.015	7	$ 240.00
			Total Costs	$ 240.00

Table 13. Dryland, Allsweet Fertilizer Layer

A default fertilizer application has been specified but can be modified to match your operation. Double-click anywhere in the fertilizer table yellow cells for a pop-up screen with fertilizer information. Adjust the fertilizer mixes and amounts to approximately meet the nitrogen (N), phosphorus (P), and potassium (K) requirements.

Fertilizer	Month to Apply	Lbs. Applied per Acre	Acreage Applied	Percent N	Percent P	Percent K	Price per Ton	Custom App. Charge	Fertilizer Price/Lb.
Ammonium Nitrate	4	150	40	34%	0%	0%	$ 187.00	$ -	$ 0.094
Ammonium Nitrate	4	150	40	34%	0%	0%	$ 187.00	$ -	$ 0.094
									$ -
									$ -
									$ -
									$ -
									$ -
									$ -
Pounds/acre applied				102	0	0			
Pounds of N/acre present per soil test results				0					
Estimated pounds N, P and K required				100	0	0			

Fertilizer cost/budget acre	$28.05
Prorated lime cost/budget acre	$ -
Prorated zinc cost/budget acre	$ -
Total cost/budget acre	$28.05
Custom application cost/budget acre	$ -

Budget

Table 14. Dryland, Allsweet Disease Control Layer

Individual Disease Control Programs

Below is the cost summary for various disease control programs including fungicides, bactericides,and nematicides. You may use the specified costs or make changes by clicking on the individual disease control button.

Disease Control Summary	Total Cost	Share Total
Fungicides	$ 147.61	$ 147.61
Bactericides	$ -	$ -
Nematicides	$ -	$ -
Total cost	$ 147.61	$ 147.61

Table 15. Dryland, Allsweet Insecticide Control Layer

Default insecticide practices have been specified. You can use the defaults or specify your own applications. Double-click anywhere in the yellow area for a list of default insecticides. You may also click on the "Insect Info" button for a list of insect information.

Insecticide	Month to Apply	Application Unit	Units per Acre	Acreage Applied	Cost Per Unit	Custom App. Charge	Cost of Chemical	Total App. Cost
Furadan 4F	4	Pint	1.00	40	$ 9.73	$ -	$ 9.73	$ 9.73
Metasystox-R	5	Lbs. A.I.	0.50	40	$ 38.00	$ -	$ 19.00	$ 19.00
Capture	6	Lbs. A.I.	0.10	40	$ 196.00	$ -	$ 19.60	$ 19.60
							$ -	$ -
							$ -	$ -
							$ -	$ -
							$ -	$ -
							$ -	$ -
							$ -	$ -
							$ -	$ -
						Total cost per budget acre	$ 48.33	$ 48.33

Table 16. Dryland, Allsweet Herbicide Control Layer

Default herbicide practices have been specified. You can use the defaults or specify your own applications. Double-click anywhere in the herbicide table yellow cells to access a list of default herbicides.

Herbicide	Month to Apply	Applicaton Unit	Units per Acre	Acreage Applied	Cost Per Unit	Custom App. Charge	Cost of Chemical	Total App. Cost
Curbit 3EC	4	Lbs. A.I.	1.69	40	$ 12.33	$ -	$ 20.84	$ 20.84
Treflan	5	Lbs. A.I.	1.00	40	$ 6.10	$ -	$ 6.10	$ 6.10
							$ -	$ -
							$ -	$ -
							$ -	$ -
							$ -	$ -
							$ -	$ -
							$ -	$ -
							$ -	$ -
							$ -	$ -
						Total cost per budget acre	$ 26.94	$ 26.94

Table 17. Dryland, Allsweet Hoeing Labor Layer

Specify hoeing labor expense for the watermelon not included in the machinery sections You can use the default labor values or specify the labor hours, wage rate, and month(s) of

Hoeing Labor	Hours	Wage Rate/Hr.	Month of Expense
Default	9.00	$ 7.50	Months
Your Value	9.00		

Table 18. Dryland, Allsweet Pruning Labor Layer

Specify pruming labor expense for the watermelon not included in the machinery sections You can use the default labor values or specify the labor hours, wage rate, and month(s) of

Pruming Labor	Hours	Wage Rate/Hr.	Month of Expense
Default	4.00	$ 7.50	Months
Your Value			

Table 19. Dryland, Allsweet Harvest Labor Layer

Specify harvest labor expense for the watermelon not included in the machinery sections You can use the default labor values or specify the labor hours, wage rate, and month(s) of

Harvest Labor	Hours	Wage Rate/Hr.	Month of Expense
Default	0.00	$ 7.50	Months
Your Value			

Table 20. Dryland, Allsweet Parameter Settings

Parameter Settings - Listed below are typical estimates for labor, fuel, interest rates and other items used in the budget calculations. You can use the defaults or specify values to be used in the "Your Value" column.

Parameter Settings	Default	Your Value
Typical wage rate paid for labor	$ 7.50	
Average fuel price (diesel)	$ 1.00	
Annual operating capital interest rate	6.75%	
Interest rate charged on machinery loans	6.50%	
Percent taxes on machinery purchase price	1.00%	
Percent insurance on machinery average value	0.60%	
Annual capital month	7	
Opportunity interest rate charged on land capital	0.00%	
Percent ad valorem tax rate on land	0.00%	
Per acre average value for land	$ -	
Percent of taxes and desired rate of return assigned to watermelon	100%	

Table 21. Dryland, Allsweet Other Expense Layer

Specify any other expense not accounted for in other sections. Include a description, the month the expense will be incurred, and the cost per acre.

Other Expense	Month of Expense	Cost per Acre
Beehives	5	$ 25.00
Total Cost:		$ 25.00

Table 22. Dryland, Allsweet Non-Harvest Machinery Cost Layer

Non-Harvest Machinery Costs

Default costs are representative for the farm size/organization and the machinery complement you initially specified, the level of custom service selected, and include **non-harvest** operations only. Any changes you make in the "Your Value" column will be used instead of the default value.

	Default	Your Value
Variable costs ($/acre)		
Fuel	$ 7.42	
Lube	$ 1.11	
Repairs	$ 15.54	
Total	**$ 24.07**	**$ 24.07**
Fixed costs ($/acre)		
Depreciation	$ 28.65	
Insurance	$ 1.40	
Taxes	$ 3.77	
Interest	$ 15.17	
Total	**$ 48.98**	**$ 48.98**
Hours of labor (Hrs/Acre)	3.78	
Tractor #1 (hp)	45	
Tractor #2 (hp)		
Tractor #3 (hp)		
Labor costs per acre	$ 28.35	$ 28.35
Total owned machinery costs	**$ 101.40**	**$ 101.40**
Total custom machinery costs		**$ 14.00**
Total machinery costs		**$ 115.40**

Select the appropriate machinery choice:

- (•) **Use Owned Equipment Only**
- ( ) **Use Custom Work Only**
- ( ) **Use Owned Equipment and Custom Work**

	Owned	Custom
Fertilizer Operations	(•)	( )
Pesticide Operations	(•)	( )
Planting Operations	(•)	( )
All Other Operations	(•)	( )

For additional information, see:
CR-205 Oklahoma Farm and Ranch Custom Rates
View these and other OSU Publications at:
http://agweb.okstate.edu/pearl/
http://www.dasnr.okstate.edu/agmach/

Table 23. Dryland, Allsweet Zinc Application Layer

Combating zinc deficiency may be a problem for some producers. Specify any zinc applications below.

Month to Apply	Pounds Applied per acre	Acreage Applied	Price per Pound	Charge for Custom Application	# of Years to Allocate App. Over
2	-	40	$ 0.61	$ 4.75	5

Total cost of zinc:	**$ -**	**/budget ac.**
Prorated cost:	**$ -**	**/budget ac.**

Return

For further information see:
E-853 Cucurbit Integrated Crop Management

View this and other OSU Fact Sheets at: http://agweb.okstate.edu

Table 24. Dryland, Allsweet Nitrogen Layer

Nitrogen Recommendations

50 pounds/acre of nitrogen should be available at pre-plant with an additional 40-60 pounds sidedressed at 3 weeks after emergence.

Phosphorus Recommendations

Soil Test Index*	Rate of P_2O_5 (lbs./A)
0 - 19	100
20 - 39	75
40 - 69	50
70 - 99	25
100+	0

*Oklahoma State University Tests

Potassium Recommendations

Soil Test Index*	Rate of K_2O (lbs./A)
0 - 99	230
100 - 149	150
150 - 199	100
200 - 249	50
250+	0

*Oklahoma State University Tests

Return

For additional information, see:
E-853 Cucurbit Integrated Crop Management

View these and other OSU Publications at:
http://agweb.okstate.edu/pearl/

Table 25. Dryland, Allsweet Lime Layer

Combating extreme soil acidity has become a primary production problem for many producers. Specify any lime applications below.

Month to Apply	Tons Applied per acre	Acreage Applied	Percent ECCE	Price per Ton	Charge for Custom Application	# of Years to Allocate App. Over
2	-	40	50%	$ 14.00	$ 4.75	5

Total cost of lime:	**$**	**-**	**/budget ac.**
Prorated cost:	**$**	**-**	**/budget ac.**
ECCE equivalent applied:		**-**	**tons/acre**

Return

For further information see: E-853 Cucurbit Integrated Crop Management
F-2229 Soil pH and Buffer Index
F-2239 Causes and Effects of Soil Acidity

View these and other OSU Fact Sheets at:
http://agweb.okstate.edu/pearl/

Table 26. Dryland, Allsweet Irrigation Layer

The default information is based on the irrigation system (three center pivot choices and a side roll) and power source selection. To view the line-items for the default calculations, click the Irrigation Details button. Any changes you make in the "Your Value" column will be used instead of the default value.

Will this crop be irrigated (check "Irrigated" box if yes)?

☐ Irrigated

Type of Irrigation System: Side Roll Pump Power Source: Natural Gas

Irrigation Costs	Default	Your Value
Application Efficiency		
Inches of water required by crop		
Inches provided by rainfall		
Inches required from irrigation		-
Inches required with efficiency		-
Variable Cost ($/acre)		
Cost per acre inch of water		
Percent of cost related to repairs		
Total		$ -
Fixed Cost ($/acre)		
Depreciation		
Insurance		
Taxes		
Interest		
Total		$ -
Hours of irrigation labor per acre	0.00	
Labor cost per acre		$ -
Total irrigation costs		$ -

Monthly Water Application	Default	Your Value
January	-	
February	-	
March	-	
April	-	
May	-	
June	-	
July	-	
August	-	
September	-	
October	-	
November	-	
December	-	
Annual Total:		0.00
Your gross annual value:		0.00

Table 27. Irrigation, Allsweet Enterprise Budget

Irrigated Watermelon Enterprise Budget
40 acres farmed

OSU
OKLAHOMA COOPERATIVE EXTENSION SERVICE

Name
Farm Description

					Total
PRODUCTION	**Units**	**Price**	**Quantity**		**$/Acre**
Watermelon	Pound	$ 0.07	16000	$	1,120.00
Other Income	Acre	$ -	0	$	-
Total Receipts				**$**	**1,120.00**
OPERATING INPUTS	**Units**	**Price**	**Quantity**		**$/Acre**
Watermelon Seed	lbs/acre	$ 18.00	5.00	$	90.00
Fertilizer	Acre	$ 28.05	1	$	28.05
Disease Control	Acre	$ 147.61	1	$	147.61
Insect Control	Acre	$ 48.33	1	$	48.33
Weed Control	Acre	$ 26.94	1	$	26.94
Crop Insurance	Acre	$ -	0	$	-
Staking Labor	Hrs.	$ -	0	$	-
Tieing Labor	Hrs.	$ -	0	$	-
Hoeing Labor	Hrs	$ 7.50	9	$	67.50
Pruning Labor	Hrs.	$ 7.50	4	$	30.00
Harvesting Labor	Hrs.	$ 7.50	0	$	-
Marketing and Grading	Acre	$ 240.00	1	$	240.00
Annual Operating Capital	Dollars	6.75%	83.18	$	5.61
Machinery Labor	Hrs.	$ 7.50	3.78	$	28.35
Irrigation Labor	Hrs.	$ -	0.00	$	-
Custom Hire	Acre	$ 14.00	1	$	14.00
Machinery Fuel, Lube, Repairs	Acre	$ 24.07	1	$	24.07
Irrigation Fuel, Lube, Repair	Acre	$ -	0	$	-
Other Expense	Acre	$ 25.00	1	$	25.00
Total Operating Costs				**$**	**775.46**
Returns Above Total Operating Costs				**$**	**344.54**
FIXED COSTS	**Units**	**Rate**			**$/Acre**
Machinery/Irrigation	$/value				
Interest at	Dollars	6.50%		$	66.94
Taxes at	Dollars	1.00%		$	11.73
Insurance	Dollars	0.60%		$	6.18
Depreciation	Dollars			$	81.77
Land	$/acre	$ -			
Interest at	Dollars	0.00%		$	-
Taxes at	Dollars	0.00%		$	-
Total Fixed Costs				**$**	**166.62**
Total Costs (Operating + Fixed)				**$**	**942.08**
Returns Above All Specified Costs				**$**	**177.92**

Adobe

Adobe Acrobat Reader Required for Fact Sheet Links

Canadian County - North-Central OK
Owned field - harvest equipment
Owner-Operator
Used machinery complement

Break-Even (B-E) Analysis			
B-E Yield at $/lb.	**0.07**	**B-E Price at lbs./acre**	**16000**
Above Operating Costs (Lbs.)	11078	Above Operating Costs	$ 0.048
Above Total Costs (Lbs.)	13458	Above Total Costs	$ 0.059

Break-even yield is the yield needed to cover costs given the expected price and other income such as government payments. Break-even price is the price needed to cover costs given the expected yield and other income.

Table 28. Irrigation, Allsweet Yield, Price, and Harvest Layer

You can specify the yield and price for your enterprise or use the default for the area you selected. To view average yields and prices, click on the link below. For a schedule of premiums and discounts, click on the Premium/Discount button. You may change the peanut type by clicking the on Variety button.

Watermelon Type Allsweet	Area	Yield lbs./acre	Price ($/cwt)	Harvest Date	Sales Information	Weighted Ave Price
Default	Southwest	20,000	$ 6.99	7/5/02	Month(s)	$ 6.99
Your Value		16,000	$ 6.99			$ 6.99

Table 29. Irrigation, Allsweet Other Income Layer

Specify any other income not accounted for in other sections. Include a description, the month the income will be received, and the income per acre. Use the first two lines for government payments.

Other Income	Month of Income	Income per Acre
Direct Payment		
Counter-Cyclical Payment		
Total Other Income:		$ -

Table 30. Irrigation, Allsweet Seeding Rate, Seed Cost, and Planting Date Layer

You can specify the variety, seeding rate, price of seed, and planting date for your enterprise, or use the default values. Irrigation recommendations and disease resistance can be viewed by clicking the More Information

Seeding Rate	Area	lbs/acre Planted	Seed Cost $/acre	Planting Date
Default	State	5.00	$ 18.00	4/1/02
Your Value				

revise "More Info" for melons if warranted.

Table 31. Irrigation, Allsweet Disease Control Layer

Individual Disease Control Programs

Below is the cost summary for various disease control programs including fungicides, bactericides,and nematicides. You may use the specified costs or make changes by clicking on the individual disease control button.

Disease Control Summary	Total Cost	Share Total
Fungicides	$ 147.61	$ 147.61
Bactericides	$ -	$ -
Nematicides	$ -	$ -
Total cost	$ 147.61	$ 147.61

Table 32. Irrigation, Allsweet Fertilizer Layer

A default fertilizer application has been specified but can be modified to match your operation. Double-click anywhere in the fertilizer table yellow cells for a pop-up screen with fertilizer information. Adjust the fertilizer mixes and amounts to approximately meet the nitrogen (N), phosphorus (P), and potassium (K) requirements.

Fertilizer	Month to Apply	Lbs. Applied per Acre	Acreage Applied	Percent N	Percent P	Percent K	Price per Ton	Custom App. Charge	Fertilizer Price/Lb.
Ammonium Nitrate	4	150	40	34%	0%	0%	$ 187.00	$ -	$ 0.094
Ammonium Nitrate	4	150	40	34%	0%	0%	$ 187.00	$ -	$ 0.094
									$ -
									$ -
									$ -
									$ -
									$ -
									$ -
Pounds/acre applied				102	0	0			
Pounds of N/acre present per soil test results				0					
Estimated pounds N, P and K required				100	0	0			

Fertilizer cost/budget acre	$28.05
Prorated lime cost/budget acre	$ -
Prorated zinc cost/budget acre	$ -
Total cost/budget acre	$28.05
Custom application cost/budget acre	$ -

Budget

Table 33. Irrigation, Allsweet Marketing and Harvesting Layer

Post-Harvest Expense - Listed below are costs for post-harvest watermelons. You can use the defaults specified or make adjustments in the "Your Value" column.

Post-Harvest Expense	Default	Your Value	Month of Expense	Cost Per Acre
Marketing/Grading per Pound	$ 0.015	$ 0.015	7	$ 240.00
			Total Costs	$ 240.00

Table 34. Irrigation, Allsweet Insecticide Control Layer

Default insecticide practices have been specified. You can use the defaults or specify your own applications. Double-click anywhere in the yellow area for a list of default insecticides. You may also click on the "Insect Info" button for a list of insect information.

Insecticide	Month to Apply	Application Unit	Units per Acre	Acreage Applied	Cost Per Unit	Custom App. Charge	Cost of Chemical	Total App. Cost
Furadan 4F	4	Pint	1.00	40	$ 9.73	$ -	$ 9.73	$ 9.73
Metasystox-R	5	Lbs. A.I.	0.50	40	$ 38.00	$ -	$ 19.00	$ 19.00
Capture	6	Lbs. A.I.	0.10	40	$ 196.00	$ -	$ 19.60	$ 19.60
							$ -	$ -
							$ -	$ -
							$ -	$ -
							$ -	$ -
							$ -	$ -
							$ -	$ -
							$ -	$ -
					Total cost per budget acre		$ 48.33	$ 48.33

Table 35. Irrigation, Allsweet Herbicide Layer

Default herbicide practices have been specified. You can use the defaults or specify your own applications. Double-click anywhere in the herbicide table yellow cells to access a list of default herbicides.

Herbicide	Month to Apply	Applicaton Unit	Units per Acre	Acreage Applied	Cost Per Unit	Custom App. Charge	Cost of Chemical	Total App. Cost
Curbit 3EC	4	Lbs. A.I.	1.69	40	$ 12.33	$ -	$ 20.84	$ 20.84
Treflan	5	Lbs. A.I.	1.00	40	$ 6.10	$ -	$ 6.10	$ 6.10
							$ -	$ -
							$ -	$ -
							$ -	$ -
							$ -	$ -
							$ -	$ -
							$ -	$ -
							$ -	$ -
							$ -	$ -
					Total cost per budget acre		$ 26.94	$ 26.94

Table 36. Irrigation, Allsweet Hoeing Labor Layer

Specify hoeing labor expense for the watermelon not included in the machinery sections You can use the default labor values or specify the labor hours, wage rate, and month(s) of

Hoeing Labor	Hours	Wage Rate/Hr.	Month of Expense
Default	9.00	$ 7.50	Months
Your Value	9:00		

Table 37. Irrigation, Allsweet Pruning Labor Layer

Specify pruming labor expense for the watermelon not included in the machinery sections You can use the default labor values or specify the labor hours, wage rate, and month(s) of

Pruming Labor	Hours	Wage Rate/Hr.	Month of Expense
Default	4.00	$ 7.50	Months
Your Value			

Table 38. Irrigation, Allsweet Harvest Labor Layer

Specify harvest labor expense for the watermelon not included in the machinery sections You can use the default labor values or specify the labor hours, wage rate, and month(s) of

Harvest Labor	Hours	Wage Rate/Hr.	Month of Expense
Default	0.00	$ 7.50	Months
Your Value			

Table 39. Irrigation, Allsweet Non-Harvest Machinery Cost Layer

Non-Harvest Machinery Costs

Default costs are representative for the farm size/organization and the machinery complement you initially specified, the level of custom service selected, and include **non-harvest** operations only. Any changes you make in the "Your Value" column will be used instead of the default value.

	Default	Your Value
Variable costs ($/acre)		
Fuel	$ 7.42	
Lube	$ 1.11	
Repairs	$ 15.54	
Total	**$ 24.07**	**$ 24.07**
Fixed costs ($/acre)		
Depreciation	$ 28.65	
Insurance	$ 1.40	
Taxes	$ 3.77	
Interest	$ 15.17	
Total	**$ 48.98**	**$ 48.98**
Hours of labor (Hrs/Acre)	3.78	
Tractor #1 (hp)	45	
Tractor #2 (hp)		
Tractor #3 (hp)		
Labor costs per acre	$ 28.35	$ 28.35
Total owned machinery costs	**$ 101.40**	**$ 101.40**
Total custom machinery costs		**$ 14.00**
Total machinery costs		**$ 115.40**

Select the appropriate machinery choice:

- (•) **Use Owned Equipment Only**
- ( ) **Use Custom Work Only**
- ( ) **Use Owned Equipment and Custom Work**

	Owned	Custom
Fertilizer Operations	(•)	( )
Pesticide Operations	(•)	( )
Planting Operations	(•)	( )
All Other Operations	(•)	( )

	$ 7.
	$ 1.
	6.7
	6.5
	1.00%
	0.60%
	7
	0.00%
	0.00%
	$ -
rmelon	100%

For additional information, see:
CR-205 Oklahoma Farm and Ranch Custom Rates
View these and other OSU Publications at:
http://agweb.okstate.edu/pearl/
http://www.dasnr.okstate.edu/agmach/

Table 40. Irrigation, Allsweet Irrigation Layer

The default information is based on the irrigation system (three center pivot choices and a side roll) and power source selection. To view the line-items for the default calculations, click the Irrigation Details button. Any changes you make in the "Your Value" column will be used instead of the default value.

Will this crop be irrigated (check "Irrigated" box if yes)?

☑ Irrigated

Type of Irrigation System: Side Roll Pump Power Source: Natural Gas

Irrigation Costs	Default	Your Value
Application Efficiency	70%	
Inches of water required by crop	8	
Inches provided by rainfall	8	
Inches required from irrigation		-
Inches required with efficiency		-
Variable Cost ($/acre)		
Cost per acre inch of water	$ 1.41	
Percent of cost related to repairs	40%	
Total		$ -
Fixed Cost ($/acre)		
Depreciation	$ 53.12	
Insurance	$ 4.78	
Taxes	$ 7.96	
Interest	$ 51.77	
Total		$ 117.64
Hours of irrigation labor per acre	0.00	
Labor cost per acre		$ -
Total irrigation costs		$ 117.64

Monthly Water Application	Default	Your Value
January	-	
February	-	
March	-	
April	-	
May	-	
June	-	
July	-	
August	-	
September	-	
October	-	
November	-	
December	-	
Annual Total:		0.00
Your gross annual value:		0.00

Table 41. Irrigation, Allsweet Other Expense Layer

Specify any other expense not accounted for in other sections. Include a description, the month the expense will be incurred, and the cost per acre.

Other Expense	Month of Expense	Cost per Acre
Beehives	5	$ 25.00
Total Cost:		$ 25.00

Table 42. Irrigation, Allsweet Zinc Layer

Combating zinc deficiency may be a problem for some producers. Specify any zinc applications below.

Month to Apply	Pounds Applied per acre	Acreage Applied	Price per Pound	Charge for Custom Application	# of Years to Allocate App. Over
2	-	40	$ 0.61	$ 4.75	5

Total cost of zinc:	$ -	/budget ac.
Prorated cost:	$ -	/budget ac.

Return

For further information see:

E-853 Cucurbit Integrated Crop Management

View this and other OSU Fact Sheets at: http://agweb.okstate.edu

Table 43. Irrigation, Allsweet Nitrogen Layer

Nitrogen Recommendations

50 pounds/acre of nitrogen should be available at pre-plant with an additional 40-60 pounds sidedressed at 3 weeks after emergence.

Phosphorus Recommendations

Soil Test Index*	Rate of P_2O_5 (lbs./A)
0 - 19	100
20 - 39	75
40 - 69	50
70 - 99	25
100+	0

*Oklahoma State University Tests

Potassium Recommendations

Soil Test Index*	Rate of K_2O (lbs./A)
0 - 99	250
100 - 149	150
150 - 199	100
200 - 249	50
250+	0

*Oklahoma State University Tests

Return

For additional information, see:
E-853 Cucurbit Integrated Crop Management

View these and other OSU Publications at:
http://agweb.okstate.edu/pearl/

Table 44. Irrigation, Allsweet Lime Layer

Combating extreme soil acidity has become a primary production problem for many producers. Specify any lime applications below.

Month to Apply	Tons Applied per acre	Acreage Applied	Percent ECCE	Price per Ton	Charge for Custom Application	# of Years to Allocate App. Over
2	-	40	50%	$ 14.00	$ 4.75	5

Total cost of lime:	**$**	**-**	**/budget ac.**
Prorated cost:	**$**	**-**	**/budget ac.**
ECCE equivalent applied:		**-**	**tons/acre**

Return

For further information see: E-853 Cucurbit Integrated Crop Management
F-2229 Soil pH and Buffer Index
F-2239 Causes and Effects of Soil Acidity

View these and other OSU Fact Sheets at:
http://agweb.okstate.edu/pearl/

VITA

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Candidate for the Degree of

Master of Science

Thesis: A COMPUTERIZED COST AND RETURN ANALYSIS FOR PRODUCING DIFFERENT WATERMELON VARIETIES IN OKLAHOMA

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