ATTACHMENT 7B

AGRICULTURAL DATA FOR THE YAZOO BACKWATER AREA OF MISSISSIPPI

Agricultural Data for the Yazoo Backwater Area of Mississippi

submitted by

The Division of Agriculture, Forestry & Veterinary Medicine
Mississippi State University

to

The U.S. Army Corps of Engineers, Vicksburg District

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Soybean Production In The Lower Mississippi Delta

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Overview

The lower Mississippi Delta encompasses all or parts of eight counties–Humphreys, Issaquena, Leflore, Sharkey, Sunflower, Warren, Washington, and Yazoo. All of these counties have significant crop acreage, and all except Warren are in the National Agricultural Statistics Service's (NASS) Mississippi District 40. For the purposes of this report, data from NASS District 40 will be used since they encompass almost all of the subject area. It is not objectively possible to delineate the portion of Warren County's 5-year (2000–2004) average of 16,300 soybean acres that are in the lower Delta, but it is assumed that those that are will perform in a manner similar to those on the acreage in District 40 counties.

In 2002 through 2004, cotton, corn, rice, grain sorghum, and soybeans (all summer crops) were grown on over 1.3 million acres in the seven-county District 40 (Table 1.1). Soybeans were grown on 546 thousand acres (3-year average), or 42% of the total acreage devoted to the five major summer crops. In 2004, 1,325,100 acres were allocated to the five crops, with soybeans occupying nearly half (47%) of the total. The economic impact from production of soybeans on this much acreage in this relatively small area is significant.

Soybeans in the lower Mississippi Delta are planted mostly on clayey soils that are often in the lowest-lying areas of the region. These areas are the first to flood from inundating rainfall or from backwater that occurs during high-water events when the region cannot drain. This, compounded with their occupying the largest acreage of any crop grown in the region, makes them the most susceptible crop to economic losses from flooding.

Weather and Soybean Production

The typical summer weather pattern (Table 1.2) in the lower Mississippi Delta results in increasing drought and/or heat stress from July through September. These stresses result in uneconomical yields from nonirrigated soybean plantings that are made after early May. Because of the pattern of summer drought, irrigation of soybeans is widely practiced. The 2002 Census of Agriculture estimated that about 200,000 soybean acres in the region were irrigated that year. Irrigated acres are estimated to be greater than that now. The impact of irrigated soybean acres on the agricultural sector is greater than their percentage acreage because of the greater yields from those acres (See Tables 1.4 and 1.5).

The average dates of last spring frost (36°) at locations in the lower Delta occur in late March/early April (Table 1.3). The average dates for the last spring freeze (32°) occur in mid-March. These estimated last spring dates of cold weather allow early planting of soybeans, and this practice is now being used to avoid some of the detrimental effects from summer drought and heat stress in the region.

Table 1.1. Crop acreage harvested in the lower Mississippi Delta–NASS District 40.

County	Year	Cotton	Corn	Rice	Sorghum	Soybean
Humphreys	2004	61,500	11,900	4,200	NA	62,500
	2003	59,000	20,700	4,000	5,400	50,800
	2002	65,800	16,400	3,500	4,200	36,500
Issaquena	2004	17,800	20,700	NA	NA	44,600
	2003	17,500	31,100	NA	NA	37,400
	2002	15,000	34,000	NA	NA	34,800
Leflore	2004	80,200	18,100	17,900	NA	99,500
	2003	82,600	28,000	18,200	7,800	86,800
	2002	76,200	26,500	20,700	7,600	87,100
Sharkey	2004	37,600	27,900	4,100	NA	56,000
	2003	37,800	32,200	3,800	NA	52,200
	2002	42,500	30,500	5,000	NA	48,300
Sunflower	2004	55,800	27,100	33,400	5,400	167,400
	2003	60,500	31,900	33,000	10,800	139,400
	2002	66,500	28,800	37,100	10,000	128,300
Washington	2004	89,200	26,900	28,000	2,200	161,600
	2003	89,200	41,800	28,700	5,700	139,900
	2002	92,300	47,000	29,900	10,200	118,800
Yazoo	2004	78,400	46,200	NA	NA	30,600
	2003	80,200	43,300	NA	NA	33,300
	2002	85,400	47,300	NA	1,900	22,600
Other	2004	NA	NA	3,900	4,500	NA
	2003	NA	NA	4,300	2,400	NA
	2002	NA	NA	3,600	1,100	NA
3-year Average		430,300	212,800	94,400	26,400	546,100

Available at http://www.nass.usda.gov/QuickStats/

Table 1.2. Growing season weather at Stoneville, MS, 1971–2000.

Month	Average temperature Maximum	Average temperature Minimum	Average Rainfall	Average Pan Evaporation
	-------------°F-------------		-------------in.-------------	
April	74.0	53.0	5.5	6.1
May	82.5	62.5	5.2	7.7
June	89.0	69.5	4.0	8.3
July	91.5	72.5	3.9	8.0
August	91.0	70.0	2.0	7.4
September	85.5	63.0	3.2	6.0

Available at http://msa.ars.usda.gov/statmsa/TOCWeather.htm

Table 1.3. Estimated* 50% and 10% last spring frost (36°) and last spring freeze (32°) dates in the lower Mississippi Delta.

Location	50% last frost	10% last frost	50% last freeze	10% last freeze
Vicksburg	Mar. 30	Apr. 14	Mar. 20	Apr. 8
Rolling Fork	Mar. 29	Apr. 12	Mar. 15	Apr. 5
Yazoo City	Mar. 31	Apr. 15	Mar. 16	Apr. 7
Belzoni	Mar. 28	Apr. 12	Mar. 10	Apr. 4
Greenwood	Apr. 1	Apr. 19	Mar. 18	Apr. 12
Stoneville	Mar. 28	Apr. 13	Mar. 11	Mar. 31

*Probability of later date of occurrence. For 50% dates, there is a 50% chance (5 years in 10) of occurrence later than date shown. For 10% dates, there is a 10% chance (1 year in 10) of occurrence later than date shown.

Source: U.S. Climate Normals, Freeze/Frost Data 1971-2000, CLIM 20-01, National Climatic Data Center, Asheville, NC (available online at http://www5.ncdc.noaa.gov/cgi-bin/climatenormals/climatenormals.pl). The later last freeze dates for Vicksburg than for Stoneville are unexplained anomalies.

Project Tasks

Task 1–Identification of Planting Windows

During the period before the early1990s, the major portion of soybeans in Mississippi was planted after early May, with almost two-thirds planted after June 1. This system is labeled the Traditional Soybean Production System (TSPS), and was thought to be optimum for soybean culture in Mississippi during this period. From 1987 through 1991 in Mississippi, soybean planting as of May 5 averaged only 5%, with plantings made after June 1 averaging 64%. State average yield for this period was 21.5 bu/acre. Average yield in the lower Mississippi Delta was 22.6 bu/acre.

The TSPS was coupled with planting into a tilled (chisel plow, disk harrow, field cultivator) seedbed where tillage was the only method available to kill weeds before planting and/or to remedy soil surface roughness created during harvest the previous fall. Frequent rainfall in late winter and early spring in the lower Mississippi Delta often results in wet soil that cannot be effectively tilled for seedbed preparation until late April/early May. Tillage that was conducted on these soils in the spring before they were sufficiently dry for seedbed preparation tillage and smoothing was done to suppress spring weeds and/or to remove combine ruts. This resulted in a cloddy soil surface that was not suitable for planting. Thus, time of planting in the TSPS coincided with the time when soil became dry enough to prepare a seedbed. The TSPS and tillage for seedbed preparation were linked together in this scheme, but in fact the TSPS was considered to be the optimum system for growing soybeans, and it coincidentally allowed time for the till-and-plant process.

An alternative to planting into a tilled seedbed is to plant in a stale or untilled seedbed. A stale seedbed is described as "a seedbed that has received no seedbed preparation tillage just prior to planting. It may or may not have been tilled since harvest of the preceding crop. Any tillage conducted in the fall, winter, or early spring will have occurred sufficiently ahead of intended planting time to allow the seedbed to settle or become stale. A crop is planted in this unprepared seedbed, and weeds present before or at planting are killed with herbicides". The major difference in using this concept rather than the till-and-plant concept is that herbicides rather than tillage are used to kill weeds before planting. Thus, time of planting is not dictated by seedbed preparation tillage when the stale seedbed planting system is used. Rather, planting often is the first field operation conducted in the spring when using the stale seedbed system.

Starting in the early 1990s, a shift to planting in April occurred because it was perceived that this would avoid some of the normal summer drought. This production system became known as the Early Soybean Production System (ESPS). The ESPS was facilitated by the stale seedbed planting system that was further enhanced by the availability of more effective preplant, foliar-applied herbicides to kill spring vegetation before planting. The "marriage" of the stale seedbed concept and the ESPS was a natural progression toward improved soybean production in the lower Mississippi Delta. The stale seedbed planting system is now also used in the TSPS because it requires a smaller inventory of heavy equipment normally used for tillage, and it is broadly accepted that preplant tillage is not required for successful soybean culture.

By the 2000 through 2004 period, soybeans averaged nearly 50% planted by May 2 and only 11% planted after June 1. The 5-year state average yield during this period was 32.7 bu/acre. In the lower Mississippi Delta, the 5-year average yield during this period was 35.9 bu/acre. Thus, the move to earlier soybean planting in the lower Delta is associated with an increased average yield of over 13 bu/acre.

Starting in the early 2000s, many producers started planting in March. Realistically, a mid-March planting date is about as early as is practical in the region because of the aforementioned danger from freeze/frost before this date. Undocumented evidence indicates this can be successful, but that it is no more advantageous from a yield perspective than planting in early and mid-April. Its greatest advantage appears to be when used on droughty soils to ensure maturity in July.

The above discussion leads to one conclusion. There are two planting windows for soybeans in the lower Mississippi Delta. The first is defined by the ESPS, where planting early-maturing varieties is done before May 1. The second is the TSPS, where planting occurs after April 30. With each system, yields will depend on when planting occurs. The following section defines yield expectations within the two planting windows based on planting date.

There is no recognized absolute last date for planting soybeans in the lower Mississippi Delta. However, undocumented evidence indicates that plantings in the lower Mississippi Delta should not be made after late July/early August. Plantings made this late will produce some yield, but experts generally agree that their upper yield limit is in the 18 to 25 bu/acre range, with a figure of 20 bu/acre accepted as a subjective high-end average. The low yield potential with these plantings is generally considered to approach zero, or to be too low to justify harvesting. Thus, plantings made this late should be considered only as an option to recoup some fixed costs in a salvage scenario behind another crop such as cotton or corn.

Task 2–Determine Yields and Irrigation Efficiencies for Different Planting Dates

A recent summarization of long-term research (1976–2003) at Stoneville, MS is used as the basis for estimating soybean yields and irrigation efficiencies based on planting date. Four separate data sets were created for both the ESPS and TSPS. They are: 1) days to maturity (DTM) and yield results from irrigated environments (Tables 1.4 and 1.5); 2) yield results from nonirrigated environments (Tables 1.4 and 1.5); 3) yield increase from irrigation using data from sets one and two where counterpart nonirrigated and irrigated experiments had identical inputs and variables within each year and planting date (Tables 1.6 and 1.7); and 4) irrigation water added and irrigation water-use efficiency using data from experiments in data set three where amount of water added to irrigated experiments was recorded (Tables 1.6 and 1.7). Data sets one and two contain data from all experiments in the period, data set three contains some but not all data from sets one and two, and data set four contains some but not all data from data set three. Thus, data in tables 1.4 and 1.5 cannot be used to calculate data in tables 1.6 and 1.7.

The ESPS data are presented in two components; plantings made before April 16, and plantings made from April 16 through April 30. The TSPS data are presented in three components; plantings made from May 1 through May 15, plantings made from May 16 through

May 31, and plantings made after May 31.

Days-to-maturity (DTM) of varieties from each MG are also presented. However, these data are from only irrigated plantings because soybean varieties mature normally in irrigated environments. In nonirrigated plantings, abnormal maturity may occur for one of two reasons. 1) If drought is severe, plants in nonirrigated plantings may mature earlier (10 to 14 days) than normal because of lack of water; in essence, they "die" early. This is most common in May and later plantings, and is associated with low yield. 2) If drought is severe during early reproductive development, number of pods that are set will be extremely low. If drought is relieved by significant rainfall during later reproductive development after podset is completed, plants may stay green past normal maturity time because the low number of pods and seeds are insufficient to allow effective translocation of seedfill components from stems and leaves. In this case, stems and leaves stay green until frost, and harvest efficiency is lowered by the high-moisture plant materials.

Irrigated April (ESPS) plantings. Yields of MG IV varieties (62 and 60 bu/acre) were greater than those of MG V varieties (57 and 54 bu/acre) (Table 1.4). Yields from the before-April 16 plantings and the April 16 through April 30 plantings were not significantly different. Therefore, the yield of 62 bu/acre from MG IV varieties planted before April 16 should be used as the highest attainable yield from irrigated soybeans in this planting window over the long term (Table 1.8). Again, this is a long-term average. Anecdotal evidence indicates that producers may attain higher whole-farm yields in some years.

Nonirrigated April (ESPS) plantings. Yield differences between MG IV and V varieties were not significant in either April planting component (Table 1.4). Yields from plantings made during the before-April 16 period (41 and 38 bu/acre) were significantly greater than those from the April 16 through April 30 period (35 and 34 bu/acre). Highest attainable yield from each planting date component before May 1 is shown in Table 1.8.

Irrigated May and later (TSPS) plantings. In May 1 through May 15 plantings, yield of MG IV varieties (54 bu/acre) was greater than yield of MG V varieties (49 bu/acre) (Table 1.5). Varieties from MGs VI and VII had yields that were statistically similar to those of MG V varieties. In the May 16 through May 31 plantings, yields of varieties from all MGs were not different from each other. Thus, planting varieties of MG V and later provided no yield advantage in irrigated May plantings. In plantings made after May 31, yield of MG VI varieties (45 bu/acre) was greater than yield of MG IV and V varieties. Yield of MG VII varieties was not different from yield of MG VI varieties. Thus, planting MG VII varieties provided no yield advantage in June plantings. Highest attainable yields from each planting date component after April 30 are shown in Table 1.8.

Nonirrigated May and later (TSPS) plantings. In the May 1 through May 15 plantings, there was no difference in yield among varieties across all MGs (Table 1.5). In the May 16 through May 31 plantings, yields from MGs V, VI, and VII varieties (26 to 29 bu/acre) were not different, but all exceeded yield of MG IV varieties (22 bu/acre). In the after-May 31 plantings, yields from MG VI and MG VII varieties were greater than yields from MG IV and MG V varieties. In these nonirrigated TSPS plantings, planting MG V and later varieties provided no yield advantage in May 1 through May 15 plantings, planting MG VI and later varieties provided no further yield advantage in May 16 through May 31 plantings, and planting MG VII varieties provided no further yield advantage in the after-May 31 plantings. Yields of MG IV and MG V varieties declined significantly when planting occurred after May 31. Yields of MG VI and VII varieties were not affected by planting date after April 31. Highest attainable yields from each planting date component after April 30 are shown in Table 1.8.

Historically, nonirrigated yields from plantings made past early June in the lower Mississippi Delta are low and unprofitable most years. Plantings made in this timeframe are considered too risky to consider as a viable soybean production system, but may be used to recoup some return against expenses if planting can only be made then. Plantings made after early June will be totally dependent on significant, timely late-season rainfall events because of a short growing season and normal drought conditions. A likely environment that will assure some yield is where these late plantings are made following receding floodwaters where the soil moisture profile is fully charged at planting. These plantings are estimated to be capable of producing up to 25 bu/acre if the soil water profile is fully charged at planting and one or two significant rains occur during reproductive development. More than likely, yields will be lower than this based on normal weather patterns. There are no research data to address this specific scenario.

Yield Increase from Irrigation, Irrigation Water Applied, and Irrigation Efficiency--April (ESPS) plantings. There were no differences in yield increases across both MGs and both planting dates (Table 1.6). Less irrigation water was applied to MG IV (7.5 in.) than to MG V varieties (10.9 in.) in the before-April 16 plantings, whereas the amount of irrigation water applied to varieties of both MGs in the April 16 through April 30 plantings was not different. Irrigation efficiency was greater for MG IV varieties than for MG V varieties in both April planting components. Irrigation efficiency of MG IV and MG V varieties was not significantly affected by planting date before May 1.

Yield Increase from Irrigation, Irrigation Water Applied, and Irrigation Efficiency--May and later (TSPS) plantings. Yield increases from irrigating MG IV and V varieties were greater in the May plantings than in the plantings made after May 31 (Table 1.7). Yield increases from irrigating MG VI varieties were not different across planting date components, whereas irrigating MG VII varieties produced greater yield increases in the May 1 through May 15 plantings. In the May 1 through May 15 plantings, yield increases from irrigating MG IV and VII varieties were not different from each other, and both were greater than increases from irrigating MG V and VI varieties. In the May 16 through May 31 plantings, the trend was for greater yield increases from irrigating MG IV and MG V varieties. No significant differences in yield increase from irrigation between MGs were detected for the after-May 31 plantings.

In the May 1 through 15 plantings, amount of applied irrigation water increased with increasing MG (10.7 in. for MG IVs to 16.8 in. for MG VIIs) (Table 1.7). In the later plantings, the amount of irrigation water was not different among MGs. For MG IV varieties, the amount of irrigation water was not different across planting dates. For MG V through VII varieties, irrigation water applied generally declined with later planting.

In May plantings, irrigation efficiency was greatest when MG IV varieties were used (Table 1.6). In plantings made after May 31, irrigation efficiency was greatest when MG VI and MG VII varieties were used. Irrigation efficiency decreased dramatically for MG IV varieties planted after May 31. For MG V through MG VII varieties, irrigation efficiency did not significantly change with planting date.

Discussion and Conclusions. The results of this assessment of long-term yield trends lead to several conclusions. 1) MG IV varieties grown in irrigated April plantings produce superior yields and result in greater irrigation efficiency than MG V varieties. In nonirrigated April plantings, yields from varieties of MGs IV and V are similar; however, April plantings of MG V varieties reach maturity 16 to 20 days later than MG IV varieties. Thus, they are exposed to ambient conditions longer with no perceived benefit from the longer growing season. Therefore, MG IV varieties should be selected for nonirrigated and irrigated ESPS plantings made before May 1. 2) Using MG IV varieties in irrigated May plantings results in greater yields and irrigation efficiencies than varieties from MGs V, VI, and VII. Thus, MG IV varieties should be selected for May plantings that are to be irrigated. 3) In nonirrigated May 1 through May 15 plantings, using varieties from MGs IV through VII results in similar yields. However, the longer DTM of later-maturing varieties indicates that early-maturing MG IV varieties should be planted in this period. 4) In nonirrigated plantings made during the May 16 through May 31 period, MG IV varieties yield significantly less than varieties from MGs V, VI, and VII, which are equal in yield. Since MG V varieties are in the field for a shorter period than MG VI and VII varieties, their use results in the best combination of the highest yield and shortest DTM in nonirrigated late-May plantings. 5) In plantings made after May 31, varieties from all MGs produce relatively low yields, even with irrigation. In both nonirrigated and irrigated plantings made after May 31, MG VI varieties provide the best combination of yield and DTM.

Overall trends. 1) Yields and irrigation efficiencies of irrigated April and May plantings of MG IV varieties are high relative to all other yields and irrigation efficiencies. This supports the premise that early planting of early-maturing varieties should be used for soybean production in the lower Mississippi Delta to achieve maximum yields and production efficiency. These results promote expanding this concept to include May plantings of MG IV varieties that are to be irrigated. 2) Planting varieties that are later than necessary for the highest attainable yield results in increased DTM and the concurrent risk of detrimental late-season effects from insect pests and drought regardless of the planting date. These increased risks may not be reflected in yield, but certainly will be reflected in the additional costs associated with their abatement. This will be discussed in later sections.

Deviations from trends. Long-term summaries indicate long-term trends, and often mask severe deviations that are critical to yearly profit from soybean production. Within given years that experience worse-than-normal drought, small delays in planting even within the ESPS timeframe can affect yield of nonirrigated soybeans. Such was the case in 1999 and 2000 at Stoneville, MS. In 1999, plantings were made on April 23 and May 3, a difference of 10 days. In 2000, plantings were made on April 20 and April 27, a difference of 7 days. Both years experienced severe drought in July and August (1.26 and 0.64 total inches of rain, respectively). Yield of the earlier planting in 1999 was 31.6 bu/acre, whereas yield of the 10-day-later planting was only 11.8 bu/acre. In 2000, the earlier planting yielded 34.4 bu/acre and the 7-day-later planting yielded 15.6 bu/acre. This supplements the above information; that is, planting as early as possible within the ESPS timeframe offers the best opportunity for the highest yield in nonirrigated plantings. This is arbitrarily defined as planting before April 20 even though the above discussion includes plantings made through the end of April as part of the ESPS.

Table 1.4. Days to maturity and seed yield (variables) by planting date and maturity group within early soybean production system (ESPS) plantings grown in both nonirrigated and irrigated environments at Stoneville, MS, 1976–2003.

Planting date	Maturity group IV	Maturity group V
	Days to maturity[x]	
A. Before Apr. 16	140 aB[y]	160 aA
B. Apr. 16 through April 30	136 bB	152 bA
	Irrigated yield--bu/acre	
A. Before Apr. 16	62 aA	57 aB
B. Apr. 16 through April 30	60 aA	54 aB
	Nonirrigated yield--bu/acre	
A. Before Apr. 16	41 aA	38 aA
B. Apr. 16 through April 30	35 bA	34 bA

[x]Days from planting to full maturity in irrigated environments.
[y]Values within a maturity group column of a variable that are followed by the same lowercase letter are not significantly different. Values within a planting date row that are followed by the same uppercase letter are not significantly different at $p \leq 0.05$.

Table 1.5. Days to maturity and seed yield (variables) by planting date and maturity group within traditional soybean production system (TSPS) plantings grown in both nonirrigated and irrigated environments at Stoneville, MS, 1976–2003.

Planting date	Maturity group IV	V	VI	VII
		Days to maturity[x]		
C. May 1 through May 15	127 aD[y]	138 aC	152 aB	161 aA
D. May 16 through May 31	120 bD	128 bC	136 bB	153 bA
E. After May 31	98 cC	117 cB	120 cB	133 cA
		Irrigated yield--bu/acre		
C. May 1 through May 15	54 aA	49 aB	49 aB	50 aAB
D. May 16 through May 31	47 bA	46 aA	44 bA	46 abA
E. After May 31	36 cB	38 bB	45 abA	43 bA
		Nonirrigated yield--bu/acre		
C. May 1 through May 15	26 aA	28 aA	26 aA	25 aA
D. May 16 through May 31	22 abB	26 aA	29 aA	28 aA
E. After May 31	17 bB	20 bB	28 aA	25 aA

[x]Days from planting to full maturity in irrigated environments.
[y]Values within a maturity group column of a variable that are followed by the same lowercase letter are not significantly different. Values within a planting date row that are followed by the same uppercase letter are not significantly different at $p \leq 0.05$.

Table 1.6. Yield increase from irrigation, amount of irrigation water applied, and irrigation efficiency (variables) by planting date and maturity group in early soybean production system (ESPS) plantings at Stoneville, MS, 1976–2003. Irrigation efficiency values were calculated from a subset of the data used to calculate yield increase.

Planting date	IV	V
	Yield increase from irrigation–bu/acre	
A. Before Apr. 16	19.8 aA[x]	17.2 aA
B. Apr. 16 through April 30	23.6 aA	18.6 aA
	Irrigation water–inches/acre	
A. Before Apr. 16	7.5 bB	10.9 aA
A. Apr. 16 through April 30	11.0 aA	11.5 aA
	Irrigation efficiency[y]–bu/acre/inch	
A. Before Apr. 16	2.35 aA	1.35 aB
B. Apr. 16 through April 30	2.23 aA	1.65 aB

[x] Values within a maturity group column of a variable that are followed by the same lowercase letter are not significantly different. Values within a planting date row that are followed by the same uppercase letter are not significantly different at $p \leq 0.05$.
[y]Bushels/acre yield increase from irrigation divided by inches of irrigation water

Table 1.7. Yield increase from irrigation, amount of irrigation water applied, and irrigation efficiency (variables) by planting date and maturity group in traditional soybean production system (TSPS) plantings at Stoneville, MS, 1976–2003. Irrigation efficiency values were calculated from a subset of the data used to calculate yield increase.

Planting date	Maturity group			
	IV	V	VI	VII
	Yield increase from irrigation--bu/acre			
C. May 1 through May 15	27.0 aA[x]	20.0 aB	20.7 aB	25.5 aA
D. May 16 through May 31	25.0 aA	21.2 aAB	16.3 aB	17.2 bB
E. After May 31	13.9 bA	15.6 bA	17.4 aA	19.0 bA
	Irrigation water--inches/acre			
C. May 1 through May 15	10.7 aA	12.1 aB	14.9 aC	16.8 aD
D. May 16 through May 31	11.8 aA	12.4 aA	11.2 bA	10.6 bA
E. After May 31	9.2 aA	9.0 bA	10.3 bA	10.4 bA
	Irrigation efficiency[y]--bu/acre/inch			
A. May 1 through May 15	2.55 aA	1.63 aB	1.39 aB	1.61 aB
B. May 16 through May 31	2.24 aA	1.76 aB	1.46 aB	1.63 aB
C. After May 31	0.76 bC	1.45 aB	1.66 aAB	1.92 aA

[x]Values within a maturity group column of a variable that are followed by the same lowercase letter are not significantly different. Values within a planting date row that are followed by the same uppercase letter are not significantly different at $p \leq 0.05$.
[y]Bushels/acre yield increase from irrigation divided by inches of irrigation water.

Table 1.8. Highest attainable yield* achieved in long-term research at Stoneville, MS based on planting date window, plus irrigation water added to highest yielding MG within each planting date window.

	Nonirrigated		Irrigated		
Planting window	MG	Yield	MG	Yield	Water
		bu/acre		bu/acre	in.
Before Apr. 16	IV	41	IV	62	7.5
Apr. 16 through April 30	IV	35	IV	60	11.0
May 1 through May 15	IV	28	IV	54	10.7
May 16 through May 31	V	29	IV	47	11.8
After May 31	VI	28	VI	45	10.3

*Yield values from Tables 1.4 and 1.5. When differences in yield among MGs were not significant, highest yield value and lowest MG number were selected.

Task 3–Identify Proxy County Or Counties Outside The Study Area

Washington County can serve as a proxy for the counties in the lower Mississippi Delta, even though its data are included in this report. It is on the northern fringe of the lower Mississippi Delta, and has the same mix of loamy and clayey soils that is common in the other counties. It has the second largest soybean acreage of the seven counties, and has essentially the same weather and climate. Over the last five years, it had the highest soybean yield of the seven counties. It is probably the county that is least affected by flooding that will occur in the lower Delta. Counties outside the Delta are not good proxies because of their topography (rolling, eroded hills), non-alluvial soils (little or no clays), and a relatively small acreage of irrigated soybeans.

The Delta Research and Extension Center (DREC) and the USDA-ARS Jamie Whitten Delta States Research Center are located in Washington County. The DREC has a Class A weather station and their website provides access to online historic and daily weather data that can be used to upgrade climate and agronomic models. Both state and federal scientists at the research center are conducting ongoing soybean research that can be used to validate and/or upgrade yield and production technology for the area. Washington County is also the site of the Delta Conservation and Demonstration Center, where research-proven crop practices and water quality technology are evaluated and monitored under actual farming conditions.

Bolivar County can also serve as a proxy county. It is adjacent to Washington County on the north side. It has many similarities to Washington County, some of which follow. 1) It has similar climate and weather. 2) Most of the soils in Bolivar and Washington Counties developed from Mississippi River alluvium, and comprise the same soil associations. 3) About two-thirds of the area of each county is comprised of clayey soils, where soybeans are predominantly grown. 4) It has a large soybean acreage (Table 1.9) which comprises 53% of the total for the five crops compared to Washington County's 46%. 5) The 5-year (2000-2004) average soybean yield for Bolivar County is 38.4 bu/acre, which is slightly lower than Washington County's 40.3 bu/acre.

A caveat to using either Washington or Bolivar Counties as a proxy is their relatively large acreage of rice (21% and 39% of total soybean acreage, respectively; Table 1.9) compared to the lower counties of the Mississippi Delta (rice acres <8% of soybean acres). Soybeans are grown as a rotation crop with rice on most of these acres. Research has shown that irrigated soybeans that are rotated with rice yield no better than those not rotated. However, nonirrigated soybeans rotated with rice will yield over 5 bu/acre more than those not rotated. Again, this is a caveat that should be considered when using any north Delta county as a proxy for the lower Delta area.

The consensus is that Washington County soybean production history will be the better proxy for soybean production in counties in the lower Mississippi Delta.

Table 1.9. Crop acreage harvested in Washington and Bolivar Counties, MS.

County	Year	Cotton	Corn	Rice	Sorghum	Soybeans	Total
Washington	2004	89,200	26,900	28,000	2,200	161,600	307,900
	2003	89,200	41,800	28,700	5,700	139,900	305,300
	2002	92,300	47,000	29,900	10,200	118,800	298,200
3-year average		90,230	38,600	28,900	6,000	140,100	303,800
Bolivar	2004	76,900	9,300	70,700	NA	210,800	367,700
	2003	81,400	13,100	75,200	5,600	186,500	361,800
	2002	80,300	13,400	77,500	6,100	177,200	354,500
3-year average		79,500	11,900	74,500	NA	191,500	361,300

Available at http://www.nass.usda.gov/QuickStats/

Task 4–Develop Crop Budgets

Eleven budgets have been developed to address possible scenarios for planting soybeans in the lower Mississippi Delta. The budgets are for nonirrigated and irrigated production systems in five planting/replanting systems, plus a budget for an ultra late planting that is not irrigated. All budgets were compiled using the Mississippi State Budget Generator version 6.0. A price of $6/bu was used for calculation of returns. The 10-year (1995–2004) market year average price is $5.86/bu for Mississippi. Diesel fuel was assigned a cost of $2.23/gal.

Development of all budgets is based on using the stale seedbed planting system rather than a till-and-plant system. Budgets include inputs for controlling soybean rust/foliar diseases and stinkbugs where appropriate. All TSPS budgets include inputs for controlling foliage-feeding insects that commonly appear in late summer. It is recognized that not all pest control inputs will be required every year, but those shown represent best management practices for addressing commonly occurring pest problems. Irrigation cost in the ESPS irrigated budget is based on applying 7.5 inches/acre of water, whereas irrigation cost in all other irrigated budgets is based on applying 11 inches/acre of water.

Inputs and their estimated costs for each of the 11 systems are shown in Tables 1.10 through 1.20. A summary of each system's costs and returns is shown in Table 1.21. Departure of each nonirrigated and irrigated system's revenue from the highest revenue system is shown in Table 1.22. Net returns do not include costs for land, management, and general farm overhead. In the Mississippi Delta, rent costs are estimated to be at least \$40/acre for nonirrigated soybean land and at least \$75/acre for irrigated soybean land.

Budget 1–ESPS –no replanting–not irrigated (Table 1.10). This budget presents estimated costs associated with planting with the ESPS, no loss of stand, and not irrigating. The calculations assume using seed of the best varieties. A net return of \$98/acre is realized, which is the highest return from the five nonirrigated systems.

Budget 2–ESPS –no replanting–irrigated (Table 1.11). This budget presents estimated costs associated with planting with the ESPS, no loss of stand, and irrigating. The calculations assume using seed of the best varieties. A net return of \$147/acre is realized, which is the highest return from the five irrigated systems.

Budget 3–ESPS with June replanting–best varieties–not irrigated (Table 1.12). This budget presents estimated costs associated with planting with the ESPS, losing the stand after emergence, and not irrigating. Replanting is in June with seed of the best varieties, which assumes the producer can obtain top-yielding varieties in the appropriate MG in mid-year. Net revenue of -\$51/acre is \$149/acre below that from the ESPS system.

Budget 4–ESPS with June replanting–best varieties–irrigated (Table 1.13). This budget presents estimated costs associated with planting with the ESPS, losing the stand after emergence, and irrigating. Replanting is in June with seed of the best varieties, which assumes the producer can obtain top-yielding varieties in the appropriate MG in mid-year. Net revenue of -\$33/acre is \$180/acre below that from the ESPS system.

Budget 5–ESPS with June replanting–inferior varieties–not irrigated (Table 1.14). This budget presents estimated costs associated with planting with the ESPS, losing the stand after emergence, and not irrigating. Replanting is in June with seed of inferior varieties of whatever MG is available under the assumption that seed of top-yielding varieties is not available in mid-season. Yield from the replanting is reduced by 8 bu/acre compared to yield in Budget 3. Net revenue of -\$97/acre is \$195/acre below that from the ESPS system.

Budget 6–ESPS with June replanting–inferior varieties–irrigated (Table 1.15). This budget presents estimated costs associated with planting with the ESPS, losing the stand after emergence, and irrigating. Replanting is in June with seed of inferior varieties of whatever MG is available under the assumption that seed of top-yielding varieties is not available in mid-season. Yield from the replanting is reduced by 8 bu/acre compared to yield in Budget 4. Net revenue of -\$73/acre is \$220/acre below that from the ESPS system.

Budget 7–TSPS May planting–not irrigated (Table 1.16). This budget presents estimated costs associated with TSPS May planting that is not irrigated. Seed of the best varieties is used assuming seed were booked or purchased early with the intention of planting in May. Net return of $17/acre is $81/acre below that from the ESPS system.

Budget 8–TSPS May planting–irrigated (Table 1.17). This budget presents estimated costs associated with TSPS May planting that is irrigated. Seed of the best varieties is used assuming seed were booked or purchased early with the intention of planting in May. Net return of $71/acre is $76/acre below that from the ESPS system.

Budget 9–TSPS June planting–not irrigated (Table 1.18). This budget presents estimated costs associated with TSPS June planting that is not irrigated. Seed of the best varieties is used assuming seed were booked or purchased early with the intention of planting in June. Net return of $19/acre is $79/acre below that from the ESPS system.

Budget 10–TSPS June planting–irrigated (Table 1.19). This budget presents estimated costs associated with TSPS June planting that is irrigated. Seed of the best varieties is used assuming seed were booked or purchased early with the intention of planting in June. Net return of $42/acre is $105/acre below that from the ESPS system.

Budget 11–late July/early August planting–not irrigated (Table 1.20). This budget presents estimated costs associated with planting soybeans following a failed crop of cotton or corn. Net return of $8/acre is $90/acre below that from the ESPS nonirrigated system.

Table 1.10 (Budget 1). Estimated resource use and costs ($/acre) for field operations (per acre) for ESPS soybeans planted in a stale seedbed and not irrigated*.

Operation/Input	Size/unit	Times over	Date	Amount	Cost
Subsoiler–every third year	3 shank	0.33	Oct. 1		4.45
Disk harrow	24 ft.	1	Oct. 5		7.02
Field cultivate	24 ft.	1	Oct. 6		5.43
Air application (5 gal.)–burndown		1	Mar. 12		4.50
Glyphosate Plus 4L	pt.			2	4.58
2,4-D amine	pt.			1.5	2.39
Valor WP	oz.			2	8.68
Plant	12R–20 in.	1	Apr. 10		9.38
Soybean seed RR MG IV–150,000 seed	lb.			50	32.00
Apron Maxx RTA	oz.			2.5	1.88
Spray broadcast	60 ft.	1	May 1		2.04
Glyphosate Plus 4L	pt.			2	4.58
Spray broadcast	60 ft.	1	May 15		2.04
Glyphosate Plus 4L	pt.			2	4.58
Spray broadcast	60 ft.	1	July 10		2.04
Headline (fungicide at early R5)	oz.			6	10.56
Air application (5 gal.)		1	July 20		4.50
Mustang Max (stink bugs)	oz.			4	6.40
Harvest soybeans	25 ft. flex	1	Aug. 25		16.58
Haul soybeans	bu.			41	6.56
Interest					3.15
Unallocated labor					4.55
Total specified cost					147.89

*Mississippi State Budget Generator v6.0. Cost of production estimates are based on 2005 input prices.

Table 1.11 (Budget 2). Estimated resource use and costs ($/acre) for field operations (per acre) for ESPS soybeans planted in a stale seedbed and irrigated*.

Operation/Input	Size/unit	Times over	Date	Amount	Cost
Disk harrow	24 ft.	1	Oct. 5		7.02
Field cultivate	24 ft.	1	Oct. 6		5.43
Roller/bedshaper/bedder	8R–38 in.	1	Oct. 10		5.71
Air application (5 gal.)–burndown		1	Mar. 12		4.50
Glyphosate Plus 4L	pt.			2	4.58
2,4-D amine	pt.			1.5	2.39
Valor WP	oz.			2	8.68
Plant	12R–20 in.	1	Apr. 10		9.38
Soybean seed RR MG IV–150,000 seed	lb.			50	32.00
Apron Maxx RTA	oz.			2.5	1.88
Spray broadcast	60 ft.	1	May 1		2.04
Glyphosate Plus 4L	pt.			2	4.58
Spray broadcast	60 ft.	1	May 15		2.04
Glyphosate Plus 4L	pt.			2	4.58
Spray broadcast	60 ft.	1	July 10		2.04
Quadris (fungicide at early R5)	oz.			6.2	13.83
Air application (5 gal.)		1	July 20		4.50
Mustang Max (stink bugs)	oz.			4	6.40
Irrigation–roll-out vinyl pipe	in.	3		7.5	67.39
Harvest soybeans	25 ft. flex	1	Sept. 3		16.58
Haul soybeans	bu.			62	9.92
Interest					4.64
Unallocated labor					4.61
Total specified cost					224.72

*Mississippi State Budget Generator v6.0. Cost of production estimates are based on 2005 input prices.

Table 1.12 (Budget 3). Estimated resource use and costs ($/acre) for field operations (per acre) for ESPS soybeans planted in a stale seedbed, replanted in June with most productive varieties, and not irrigated*.

Operation/Input	Size/unit	Times over	Date	Amount	Cost
Subsoiler–every third year	3 shank	0.33	Oct. 1		4.45
Disk harrow	24 ft.	1	Oct. 5		7.02
Field cultivate	24 ft.	1	Oct. 6		5.43
Air application (5 gal.)–burndown		1	Mar. 12		4.50
Glyphosate Plus 4L	pt.			2	4.58
2,4-D amine	pt.			1.5	2.39
Valor WP	oz.			2	8.68
Plant	12R–20 in.	1	Apr. 10		9.38
Soybean seed RR MG IV–150,000 seed	lb.			50	32.00
Apron Maxx RTA	oz.			2.5	1.88
Air application (5 gal.)–burndown		**1**	**June 10**		**4.50**
Gramoxone Max	**pt**			**2**	**9.30**
Surfactant	**oz.**			**1.6**	**0.16**
Replant	**12R–20 in.**	**1**	**June 10**		**9.38**
Soybean seed RR MG VI–150,000 seed	**lb.**			**50**	**32.00**
Apron Maxx RTA	**oz.**			**2.5**	**1.88**
Spray broadcast	60 ft.	1	June 30		2.04
Glyphosate Plus 4L	pt.			2	4.58
Spray broadcast	60 ft.	1	July 15		2.04
Glyphosate Plus 4L	pt.			2	4.58
Spray broadcast	60 ft.	1	Aug. 30		2.04
Folicur 3.6 (fungicide at R5)	oz.			4	10.40
Air application (5 gal.)		1			4.50
Mustang Max (stink bugs)	oz.		Sept. 10	4	6.40
Air application (5 gal.)		**1**	**Sept. 15**		**4.50**
Intrepid 2F (worms)	**oz.**			**4**	**7.32**
Surfactant	**oz.**			**1**	**0.10**
Harvest soybeans	25 ft. flex	1	Nov. 1		16.58
Haul soybeans	bu.			28	4.48
Interest					6.07
Unallocated labor					5.42
Total specified cost					218.58

*Mississippi State Budget Generator v6.0. Cost of production estimates are based on 2005 input prices. Bolded entries are extra expenses associated with replanting after the ESPS window.

Table 1.13 (Budget 4). Estimated resource use and costs ($/acre) for field operations (per acre) for ESPS soybeans planted in a stale seedbed, replanted in June with most productive varieties, and irrigated*.

Operation/Input	Size/unit	Times over	Date	Amount	Cost
Disk harrow	24 ft.	1	Oct. 5		7.02
Field cultivate	24 ft.	1	Oct. 6		5.43
Roller/bedshaper/bedder	8R–38 in.	1	Oct. 10		5.71
Air application (5 gal.)–burndown		1	Mar. 12		4.50
Glyphosate Plus 4L	pt.			2	4.58
2,4-D amine	pt.			1.5	2.39
Valor WP	oz.			2	8.68
Plant	12R–20 in.	1	Apr. 10		9.38
Soybean seed RR MG IV–150,000 seed	lb.			50	32.00
Apron Maxx RTA	oz.			2.5	1.88
Air application (5 gal.)–burndown		**1**	**June 10**		**4.50**
Gramoxone Max	**pt**			**2**	**9.30**
Surfactant	**oz.**			**1.6**	**0.16**
Replant	**12R–20 in.**	**1**	**June 10**		**9.38**
Soybean seed RR MG VI–150,000 seed	**lb.**			**50**	**32.00**
Apron Maxx RTA	**oz.**			**2.5**	**1.88**
Spray broadcast	60 ft.	1	June 30		2.04
Glyphosate Plus 4L	pt.			2	4.58
Spray broadcast	60 ft.	1	July 15		2.04
Glyphosate Plus 4L	pt.			2	4.58
Air application (5 gal)		1	Aug. 30		4.50
Quadris	oz.			6.2	13.83
Air application (5 gal.)		1			4.50
Mustang Max (stink bugs)	oz.		Sept. 10	4	6.40
Air application (5 gal.)		**1**	**Sept. 15**		**4.50**
Intrepid 2F (worms)	**oz.**			**4**	**7.32**
Surfactant	**oz.**			**1**	**0.10**
Irrigation–rollout vinyl pipe	in.	4		11	73.74
Harvest soybeans	25 ft. flex	1	Nov. 1		16.58
Haul soybeans	bu.			45	7.20
Interest					6.94
Unallocated labor					5.22
Total specified cost					302.86

*Mississippi State Budget Generator v6.0. Cost of production estimates are based on 2005 input prices. Bolded entries are extra expenses associated with replanting after the ESPS window.

Table 1.14 (Budget 5). Estimated resource use and costs ($/acre) for field operations (per acre) for ESPS soybeans planted in a stale seedbed, replanted in June with inferior varieties, and not irrigated*.

Operation/Input	Size/unit	Times over	Date	Amount	Cost
Subsoiler–every third year	3 shank	0.33	Oct. 1		4.45
Disk harrow	24 ft.	1	Oct. 5		7.02
Field cultivate	24 ft.	1	Oct. 6		5.43
Air application (5 gal.)–burndown		1	Mar. 12		4.50
Glyphosate Plus 4L	pt.			2	4.58
2,4-D amine	pt.			1.5	2.39
Valor WP	oz.			2	8.68
Plant	12R–20 in.	1	Apr. 10		9.38
Soybean seed RR MG IV–150,000 seed	lb.			50	32.00
Apron Maxx RTA	oz.			2.5	1.88
Air application (5 gal.)–burndown		**1**	**June 10**		**4.50**
Gramoxone Max	**pt**			**2**	**9.30**
Surfactant	**oz.**			**1.6**	**0.16**
Replant	**12R–20 in.**	**1**	**June 10**		**9.38**
Soybean seed RR MG VI–150,000 seed	**lb.**			**50**	**32.00**
Apron Maxx RTA	**oz.**			**2.5**	**1.88**
Spray broadcast	60 ft.	1	June 30		2.04
Glyphosate Plus 4L	pt.			2	4.58
Spray broadcast	60 ft.	1	July 15		2.04
Glyphosate Plus 4L	pt.			2	4.58
Spray broadcast	60 ft.	1	Aug. 30		2.04
Folicur 3.6 (fungicide at R5)	oz.			4	10.40
Air application (5 gal.)		1			4.50
Mustang Max (stink bugs)	oz.		Sept. 10	4	6.40
Air application (5 gal.)		**1**	**Sept. 15**		**4.50**
Intrepid 2F (worms)	**oz.**			**4**	**7.32**
Surfactant	**oz.**			**1**	**0.10**
Harvest soybeans	25 ft. flex	1	Nov. 1		16.58
Haul soybeans	bu.			20	3.20
Interest					6.06
Unallocated labor					5.42
Total specified cost					217.29

*Mississippi State Budget Generator v6.0. Cost of production estimates are based on 2005 input prices. Bolded entries are extra expenses associated with replanting after the ESPS window.

Table 1.15 (Budget 6). Estimated resource use and costs ($/acre) for field operations (per acre) for ESPS soybeans planted in a stale seedbed, replanted in June with inferior varieties, and irrigated*.

Operation/Input	Size/unit	Times over	Date	Amount	Cost
Disk harrow	24 ft.	1	Oct. 5		7.02
Field cultivate	24 ft.	1	Oct. 6		5.43
Air application (5 gal.)–burndown		1	Mar. 12		4.50
Glyphosate Plus 4L	pt.			2	4.58
2,4-D amine	pt.			1.5	2.39
Valor WP	oz.			2	8.68
Plant	12R–20 in.	1	Apr. 10		9.38
Soybean seed RR MG IV–150,000 seed	lb.			50	32.00
Apron Maxx RTA	oz.			2.5	1.88
Air application (5 gal.)–burndown		**1**	**June 10**		**4.50**
Gramoxone Max	**pt**			**2**	**9.30**
Surfactant	**oz.**			**1.6**	**0.16**
Replant	**12R–20 in.**	**1**	**June 10**		**9.38**
Soybean seed RR MG VI–150,000 seed	**lb.**			**50**	**32.00**
Apron Maxx RTA	**oz.**			**2.5**	**1.88**
Spray broadcast	60 ft.	1	June 30		2.04
Glyphosate Plus 4L	pt.			2	4.58
Spray broadcast	60 ft.	1	July 15		2.04
Glyphosate Plus 4L	pt.			2	4.58
Air application (5 gal)		1	Aug. 30		4.50
Quadris	oz.			6.2	13.83
Air application (5 gal.)		1			4.50
Mustang Max (stink bugs)	oz.		Sept. 10	4	6.40
Air application (5 gal.)		**1**	**Sept. 15**		**4.50**
Intrepid 2F (worms)	**oz.**			**4**	**7.32**
Surfactant	**oz.**			**1**	**0.10**
Irrigation–rollout vinyl pipe	in.	4		11	73.74
Harvest soybeans	25 ft. flex	1	Nov. 1		16.58
Haul soybeans	bu.			37	5.92
Interest					6.89
Unallocated labor					4.54
Total specified cost					295.14

*Mississippi State Budget Generator v6.0. Cost of production estimates are based on 2005 input prices. Bolded entries are extra expenses associated with replanting after the ESPS window.

Table 1.16 (Budget 7). Estimated resource use and costs ($/acre) for field operations (per acre) for TSPS soybeans planted in May and not irrigated*.

Operation/Input	Size/unit	Times over	Date	Amount	Cost
Subsoiler–every third year	3 shank	0.33	Oct. 1		4.45
Disk harrow	24 ft.	1	Oct. 5		7.02
Field cultivate	24 ft.	1	Oct. 6		5.43
Air application (5 gal.)–burndown		1	May 12		4.50
Glyphosate Plus 4L	pt.			2	4.58
Plant	12R–20 in.	1	May 15		9.38
Soybean seed RR MG IV, V–150,000 seed	lb.			50	32.00
Apron Maxx RTA	oz.			2.5	1.88
Spray broadcast	60 ft.	1	June 1		2.04
Glyphosate Plus 4L	pt.			2	4.58
Spray broadcast	60 ft.	1	June 15		2.04
Glyphosate Plus 4L	pt.			2	4.58
Spray broadcast	60 ft.	1	Aug. 10		2.04
Folicur 3.6 (fungicide at early R5)	oz.			6	15.60
Air application (5 gal.)		1	Aug. 15		4.50
Mustang Max (stink bugs)	oz.			4	6.40
Air application (5 gal.)		**1**	**Aug. 20**		**4.50**
Intrepid 2F (worms)	**oz.**			**4**	**7.32**
Surfactant	**oz.**			**1**	**0.10**
Harvest soybeans	25 ft. flex	1	Oct. 5		16.58
Haul soybeans	bu.			28	4.48
Interest					2.89
Unallocated labor					4.55
Total specified cost					151.44

*Mississippi State Budget Generator v6.0. Cost of production estimates are based on 2005 input prices. Bolded entries are extra expenses associated with planting later than the ESPS window.

Table 1.17 (Budget 8). Estimated resource use and costs ($/acre) for field operations (per acre) for TSPS soybeans planted in May and irrigated*.

Operation/Input	Size/unit	Times over	Date	Amount	Cost
Disk harrow	24 ft.	1	Oct. 5		7.02
Field cultivate	24 ft.	1	Oct. 6		5.43
Roller/bedshaper/bedder	8R–38 in.	1	Oct. 10		5.71
Air application (5 gal.)–burndown		1	May 12		4.50
Glyphosate Plus 4L	pt.			2	4.58
Plant	12R–20 in.	1	May 15		9.38
Soybean seed RR MG IV–150,000 seed	lb.			50	32.00
Apron Maxx RTA	oz.			2.5	1.88
Spray broadcast	60 ft.	1	June 1		2.04
Glyphosate Plus 4L	pt.			2	4.58
Spray broadcast	60 ft.	1	June 15		2.04
Glyphosate Plus 4L	pt.			2	4.58
Spray broadcast	60 ft.	1	Aug. 10		2.04
Quadris (fungicide at early R5)	oz.			6.2	13.83
Air application (5 gal.)		1	Aug. 15		4.50
Mustang Max (stink bugs)	oz.			4	6.40
Air application (5 gal.)		**1**	**Aug. 20**		**4.50**
Intrepid 2F (worms)	**oz.**			**4**	**7.32**
Surfactant	**oz.**			**1**	**0.10**
Irrigation–roll-out vinyl pipe	in.	4		11	73.74
Harvest soybeans	25 ft. flex	1	Oct. 10		16.58
Haul soybeans	bu.			50	8.00
Interest					3.86
Unallocated labor					4.61
Total specified cost					229.22

*Mississippi State Budget Generator v6.0. Cost of production estimates are based on 2005 input prices. Bolded entries are extra expenses associated with planting later than the ESPS window.

Table 1.18 (Budget 9). Estimated resource use and costs ($/acre) for field operations (per acre) for TSPS soybeans planted in June and not irrigated*.

Operation/Input	Size/unit	Times over	Date	Amount	Cost
Subsoiler–every third year	3 shank	0.33	Oct. 1		4.45
Disk harrow	24 ft.	1	Oct. 5		7.02
Field cultivate	24 ft.	1	Oct. 6		5.43
Spray broadcast–burndown		1	June 12		2.04
Glyphosate Plus 4L	pt.			2	4.58
Plant	12R–20 in.	1	June 15		9.38
Soybean seed RR MG VI–150,000 seed	lb.			50	32.00
Apron Maxx RTA	oz.			2.5	1.88
Spray broadcast	60 ft.	1	July 1		2.04
Glyphosate Plus 4L	pt.			2	4.58
Spray broadcast	60 ft.	1	July 15		2.04
Glyphosate Plus 4L	pt.			2	4.58
Spray broadcast	60 ft.	1	Sept. 10		2.04
Folicur 3.6 (fungicide at early R5)	oz.			6	15.60
Air application (5 gal.)		1	Sept. 15		4.50
Mustang Max (stink bugs)	oz.			4	6.40
Air application (5 gal.)		**1**	**Sept. 20**		**4.50**
Intrepid 2F (worms)	**oz.**			**4**	**7.32**
Surfactant	**oz.**			**1**	**0.10**
Harvest soybeans	25 ft. flex	1	Nov. 10		16.58
Haul soybeans	bu.			28	4.48
Interest					2.85
Unallocated labor					4.81
Total specified cost					149.20

*Mississippi State Budget Generator v6.0. Cost of production estimates are based on 2005 input prices. Bolded entries are extra expenses associated with planting later than the ESPS window.

Table 1.19 (Budget 10). Estimated resource use and costs ($/acre) for field operations (per acre) for TSPS soybeans planted in June and irrigated*.

Operation/Input	Size/unit	Times over	Date	Amount	Cost
Disk harrow	24 ft.	1	Oct. 5		7.02
Field cultivate	24 ft.	1	Oct. 6		5.43
Roller/bedshaper/bedder	8R–38 in.	1	Oct. 10		5.71
Air application (5 gal.)–burndown		1	June 12		4.50
Glyphosate Plus 4L	pt.			2	4.58
Plant	12R–20 in.	1	June 15		9.38
Soybean seed RR MG VI–150,000 seed	lb.			50	32.00
Apron Maxx RTA	oz.			2.5	1.88
Spray broadcast	60 ft.	1	July 1		2.04
Glyphosate Plus 4L	pt.			2	4.58
Spray broadcast	60 ft.	1	July 15		2.04
Glyphosate Plus 4L	pt.			2	4.58
Spray broadcast	60 ft.	1	Sept. 10		2.04
Quadris (fungicide at early R5)	oz.			6.2	13.83
Air application (5 gal.)		1	Sept. 15		4.50
Mustang Max (stink bugs)	oz.			4	6.40
Air application (5 gal.)		**1**	**Sept. 20**		**4.50**
Intrepid 2F (worms)	**oz.**			**4**	**7.32**
Surfactant	**oz.**			**1**	**0.10**
Irrigation–roll-out vinyl pipe	in.	4		11	73.74
Harvest soybeans	25 ft. flex	1	Nov. 10		16.58
Haul soybeans	bu.			45	7.20
Interest					3.64
Unallocated labor					4.61
Total specified cost					228.20

*Mississippi State Budget Generator v6.0. Cost of production estimates are based on 2005 input prices. Bolded entries are extra expenses associated with planting later than the ESPS window.

Table 1.20. (Budget 11). Estimated resource use and costs ($/acre) for field operations (per acre) for soybeans planted in late July/early August and not irrigated*.

Operation/Input	Size/unit	Times over	Date	Amount	Cost
Spray broadcast–burndown		1	July 25		2.04
Liberty/Ignite	qt.			1	16.56
Plant	12R–20 in.	1	July 30		9.38
Soybean seed RR MG VI–150,000 seed	lb.			50	32.00
Apron Maxx RTA	oz.			2.5	1.88
Spray broadcast	60 ft.	1	Aug. 15		2.04
Glyphosate Plus 4L	pt.			2	4.58
Spray broadcast	60 ft.	1	Aug. 30		2.04
Glyphosate Plus 4L	pt.			2	4.58
Air application (5 gal.)		1	Sept. 20		4.50
Intrepid 2F (worms)	oz.			4	7.32
Surfactant	oz.			1	0.10
Harvest soybeans	25 ft. flex	1	Nov. 20		16.58
Haul soybeans	bu.			20	3.20
Interest					2.23
Unallocated labor					2.59
Total specified cost					111.62

*Mississippi State Budget Generator v6.0. Cost of production estimates are based on 2005 input prices.

Table 1.21. Summary of costs* and returns ($/acre) for budgets 1 through 11. ESPS = early soybean production system, TSPS = traditional soybean production system, NI = nonirrigated, IRR = irrigated.

Budget			Costs				
(Table)	Description	Budget yield	Direct	Fixed	Total	Gross return	Net return
1 (1.10)	ESPS April–Best MG IV–no replanting–NI	41	122.70	25.19	147.89	246.00	98.11
2 (1.11)	ESPS April–Best MG IV–no replanting–IRR	62	160.51	64.21	224.72	372.00	147.28
3 (1.12)	ESPS April with June replanting–best MG VI–NI	28	188.92	29.66	218.58	168.00	-50.58
4 (1.13)	ESPS April with June replanting–best MG VI–IRR	45	235.03	67.83	302.86	270.00	-32.86
5 (1.14)	ESPS April with June replanting–inferior varieties–NI	20	187.63	29.66	217.29	120.00	-97.29
6 (1.15)	ESPS April with June replanting–inferior varieties–IRR	37	230.08	65.06	295.14	222.00	-73.14
7 (1.16)	TSPS May–Best MG IV/V–NI	28	126.25	25.19	151.44	168.00	16.56
8 (1.17)	TSPS May–Best MG IV–IRR	50	165.01	64.21	229.22	300.00	70.78
9 (1.18)	TSPS June–Best MG VI–NI	28	123.16	26.04	149.20	168.00	18.80
10 (1.19)	TSPS June–Best MG VI–IRR	45	163.99	64.21	228.20	270.00	41.80
11 (1.20)	Late July/early August planting behind another crop–NI	20	94.84	16.78	111.62	120.00	8.38

*Excludes costs for land, management, and general farm overhead. Commodity price of $6/bu.

Task 5–Identify Impacts Associated With Late Planting/Replanting

Planting inferior varieties. Results of soybean variety trials from all states appear online before the end of the calendar year (producers may use more than one state's trial results to make variety selections). Producers use these along with their personal knowledge of varietal performance to select and start booking purchase of the most productive varieties before the calendar year ends, or at the latest, before the end of January in the next calendar year. This is done to ensure getting the most productive varieties, or those that have the best combination of high yield potential and resistance/tolerance to a particular pathogen or pathogens.

Producers book enough of their selections to plant their crop one time. If a stand is not achieved or is lost due to some natural occurrence such as flooding, producers have lost the potential superior yield performance associated with early planting of top varieties. When buying seed to replant, producers may have only inferior varieties to choose from, or may have to take varieties from a non-preferred MG. This is an important loss associated with replanting, as explained by the following. The 2-year average yield of the top one-third of the MG IV varieties in the 2003–2004 Stoneville nonirrigated variety trials was 42.6 bu/acre. The 2-year average yield of the bottom one-third of the varieties in the same trials was 34.6 bu/acre. This 8 bu/acre (19%) lower yield is totally attributable to variety, since all varieties were planted on the same date and were grown under identical conditions. Thus, replanting not only will result in a lower yield because of later planting, but also because the production potential of replacement varieties is lower. This adds another loss to replanting in addition to that from the planting date difference in the long-term data discussed above.

The yield reductions from later planting discussed in Task 2 were obtained from studies that used the four to six top-yielding varieties available during each year of the study. Thus, differences among varieties in the different planting dates in a given year were not a major factor in those yield differences since the same top-yielding varieties were used in each planting date. Admittedly, the loss in yield from replanting with varieties with lower yield potential probably is not additive to the lower yield potential with late planting. However, it can be assumed there will be a calculable additional yield penalty associated with replanting with less productive varieties.

Increased inputs for planting. If the stale seedbed planting system is used for the TSPS, there likely will be additional preplant weed control costs beyond the late February/early March application of burndown herbicides. Where tillage is used to prepare a seedbed for plantings that are delayed into late May and beyond, operations just prior to planting likely will be required to kill weeds that emerged since earlier tillage. This tillage will result in an additional expense added to that for tillage conducted in March/April in anticipation of early planting.

As stated earlier, producers book seed for purchase well before intended planting time. These bookings may be based on intended planting in the ESPS window, and thus likely will be for MG IV varieties. If planting is unintentionally delayed to late May and beyond, seed of these varieties will be unsuitable because of their lower yield potential in later plantings. It is probable that the producer will be unable to swap the already-purchased seed of the early-maturing varieties for those of later-maturing varieties. If this is the case, a decision must be made as to whether or not to plant the purchased seed with the knowledge that yields from their late planting will be lower, or incur an additional cost by purchasing replacement seed with a known higher yield potential in late plantings. This is an economic decision based on cost of seed vs. expected yield from late plantings.

As indicated in the above budgets, seed costs $32/acre. At a commodity price of $6/bu, expected yield from using varieties from the appropriate MG must exceed the expected yield from varieties from early MGs by more than 5.5 bu/acre to make replacing seed feasible for late plantings. The long-term yield averages from late plantings shown in Table 1.5 indicate that this is feasible. However, losses associated with late planting are incurred regardless of the decision.

Obtaining seed for replanting will require creativity and may be expensive. Since replanting will be late (late May/early June), varieties from later MGs will be preferred. Varieties of MG VI are becoming rare because companies are not developing them in the midsouthern US. Thus, it is likely that seed of later-maturing varieties will not be available to purchase locally. If they can be found outside the area, they will more than likely be "old" and/or non-glyphosate-resistant varieties, and the cost of transporting them to the planting site may be prohibitive. In this case, the producer may be forced to "take what he/she can get" in the local area just to have something to plant. This will lead to low yields and greatly reduced income. Certainly, any chance for profit is gone under this scenario.

Increased expenses for late-season pest control. Planting late results in later maturity and the concurrent risk of detrimental late-season effects from insect pests. These increased risks may not be reflected in yield, but certainly will be reflected in the increased cost associated with their abatement (more spraying). A rule of thumb is that ESPS plantings will require an insecticide treatment for stinkbugs, but will only rarely require treatment for foliage-feeding insects. TSPS plantings will require at least one stinkbug treatment plus an insecticide application for control of late-season worms such as loopers.

More irrigation. Planting late results in later maturity and the concurrent risk of detrimental late-season effects from drought. The data in Tables 1.6 and 1.7 depict a clearcut trend; planting MG IV varieties before mid-April means at least one less irrigation event, over 3 inches less irrigation water applied, and greater irrigation efficiency (yield increase/water added) than for later TSPS plantings. Extra irrigation water for TSPS plantings translates to about $10/acre higher costs associated with their irrigation. Higher fuel prices for the foreseeable future will increase this extra cost of irrigating TSPS plantings. Also, since water for most soybean irrigation in the lower Mississippi Delta is from ground supplies, applying over 3 inches/acre more irrigation water to TSPS plantings translates to significantly greater discharge of groundwater in the region.

Threat from Asian soybean rust. Asian soybean rust is now present in the southern US. Its possible spread and threat to the midsouth soybean crop were a major concern in 2005.

Several hurricanes developed earlier than normal in the Gulf of Mexico in 2005. Projections were that these weather systems would promote rust spread and infestations in the lower midsouthern US. According to Soyfax (http://www.agfax.com/soyfax), rust was not detected in Mississippi until late July/early August 2005 in sentinel plots in the extreme southern part of the state. By this time, most ESPS plantings were past the stage (R6–full seed) for measurable damage. Was this good fortune, or will early planting become a key factor in avoiding damaging rust infestation? Only time will provide the answer. However, it is reasonable to say that early plantings will avoid late-season rust infestations that may take a whole season to build to damaging levels if the only inoculation source is from re-introduction of rust into the major soybean-producing areas of the US each year.

Rust at levels sufficient to cause soybean defoliation occurred in the southeastern states of Alabama, Georgia, Florida, and South Carolina in early September of 2005. By this time, more than 90% of Mississippi's crop was past R6 and more than one-half of the crop had been harvested. If this outbreak had occurred in Mississippi at this time, it would have resulted in significant yield loss only for MG V varieties that had been planted after late May, and for MG VI varieties that had been planted after early May. Thus, in years when rust infestations occur late in the season, most May and June plantings of soybeans in the lower Mississippi Delta will be at risk.

Loss of possible early-delivery price bonus. In some years, producers are paid a premium for delivery of new-crop beans in August. Several factors can assure August harvest and delivery, including planting MG III varieties before about April 20 and planting MG IV varieties before about April 10. Planting past these times will generally result in harvest too late to take advantage of an early delivery bonus. Producers generally do not plant with expectation of this bonus, but if the bonus is available and August harvest resulted from planting before the above dates, additional income will accrue to producers. Thus, planting as early as possible in the ESPS timeframe will assure receiving an early delivery bonus when it is available.

Later maturing varieties and later harvest. The data in Table 1.5 show that later-maturing varieties should be used in late plantings to achieve maximum yield. A MG VI variety planted in June will mature in late October and be ready for harvest in late October/early November. This guarantees late harvest and virtually guarantees late planting the following year as per the following discussion.

Wet soil during harvest. At Stoneville, Mississippi, the mid-August through early October period receives the lowest rainfall (average of about 0.09 inch/day) during the calendar year and averages about 0.20 inch/day pan evaporation. Harvest of ESPS soybeans in the lower Delta generally occurs from mid-August through early October when the aforementioned weather pattern results in dry soil. Thus, combine speed is not encumbered by wet soil and harvest efficiency should be maximum. In the 2001–2005 period, an average of 73% of Mississippi's soybeans were harvested during this period. In 2004 and 2005, 95% and 91%, respectively, of the state's soybean crop had been harvested by Oct. 10.

TSPS soybeans will be harvested from about October 10 through November. In the 1987–1991 period, only about 19% of Mississippi's crop had been harvested by October 10, and about 94% had been harvested by the end of November. During this time, average rainfall increases to about 0.14 inch/day and average pan evaporation decreases to about 0.12 inch/day. Therefore, any significant rain event or an extended period of rainy weather during the TSPS harvest season will result in wet soil that dries slowly. Harvesting will be slower, and rutting by the combine will often occur. Tillage is the only remedy for rutted soils. These two possible consequences of harvesting in wet soil will result in increased expense with no additional income. Thus, profits will be lower. If tillage for rut remediation is delayed to the spring of the following year, planting likely will be delayed beyond the ESPS window.

Unharvested crop. The problems with late planting may lead to soil conditions or yield potential that renders the crop not worth harvesting. During the last five years (2001-2005), less than 2.5% of Mississippi's planted soybean crop was not harvested. It is likely that most of this unharvested acreage was late-planted.

During the 2001-2005 period, about 11% of Mississippi's soybean acreage was planted after June 1. This translates to about 60 thousand acres in the lower Mississippi Delta. If the state's unharvested acreage is totally assigned to these 60 thousand late-planted acres, then a maximum of about 23% or 13.5 thousand of the lower Delta's late-planted acres were not harvested each year.

Overall Conclusions

Planting outside the ESPS window in the lower Mississippi Delta is caused by one of three things. First, ESPS plantings can be lost and replanted at some later date. Second, planting can be delayed past the ESPS window by some natural occurrence. Third, soybeans may be planted following a failed cotton or corn crop. Table 1.21 is a summary of revenues that are below ESPS net returns when later planting results from any of these causes.

Planting soybeans in the ESPS window results in the highest yields and net returns in the Mississippi Delta. In fact, planting in the ESPS window results in the only returns that are sufficient to cover estimated land rent costs of at least $40/acre (nonirrigated) and $75/acre (irrigated).

Negative net revenues and the largest decrease in net revenues occur when ESPS plantings are lost and replanted in June. This results from higher costs associated with replanting, and lower yields. Outside the ESPS planting window, TSPS May plantings that are irrigated will come the closest to recovering estimated land costs.

The impact from lost ESPS plantings or from plantings that are delayed past the ESPS window can be profound for two reasons. First, if 100,000 acres of nonirrigated ESPS plantings are lost and replanted annually in the lower Mississippi Delta, lost revenues will range from $149 to $220/acre, or 14.9 to 22 million dollars. If planting of 100,000 acres of soybeans is delayed past the ESPS planting window each year, lost revenues will range from 7.6 to 10.5 million dollars. In fact, there will be net losses associated with replanting outside the ESPS window, while net revenues from planting for the first time in May and June will not cover estimated land costs of at least $40/acre (nonirrigated) and $75/acre (irrigated).

Second, the ESPS is the only system that provides income sufficient to cover all costs including land. Therefore, profits from soybean production will be threatened by any occurrence that reduces ESPS acreage. This will be more profound if such occurrences become frequent. In other words, it is not that profits will be lowered; rather, profits will be nonexistent when soybeans are planted outside the ESPS window. Thus, viability of soybean production and soybean producers will be jeopardized over the long term by natural occurrences that destroy or postpone ESPS planting.

Table 1.22. Yields (bu/acre) and net revenues ($/acre–rounded to nearest whole dollar) to land, management, and general farm overhead from 6 nonirrigated (NI) and 5 irrigated (IRR) Mississippi Delta soybean production systems, and departure of net revenue from highest return system.

	Yield		Net revenue			
			Actual		Departure*	
System (MG)–table number	NI	IRR	NI	IRR	NI	IRR
ESPS (IV)–1.10 & 1.11	41	62	98	147	0	0
ESPS–June replanting (VI)– 1.12 & 1.13	28	45	-51	-33	-149	-180
ESPS–June replanting (VI)– 1.14 & 1.15	20	37	-97	-73	-195	-220
TSPS May planting (IV, V)– 1.16 & 1.17	28	50	17	71	-81	- 76
TSPS June planting (VI)– 1.18 & 1.19	28	45	19	42	-79	-105
Late July/early August (VI)– 1.20	20	---	8	---	-90	---

*Negative number indicates amount below highest net returns, which are from ESPS NI and IRR plantings.

Corn Production in the Lower Mississippi Delta

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Task 1 – Identification of Planting Windows

Mississippi's climate poses considerable risk for growers intending to grow corn. The primary environmental risks for corn production are wet springs and hot, dry summers. Growers need to plant corn early in order to avoid summer drought, but frequent rainfall and muddy soil typically restrict growers' ability to perform fieldwork and plant corn during the early spring. The optimum corn planting time in the lower Mississippi Delta is March 5 through April 10. Normally, soils are dry enough to perform fieldwork only 20-50 percent of the days during this period. Thus, inundating rainfall and backwater, which commonly occurs during this time, often prohibits corn planting altogether, since corn-planting opportunities are already quite finite. Therefore, growers are often forced to abandon their corn planting intentions and switch to a later planted crop, such as cotton or soybeans.

Task 2 – Determine Yields and Irrigation Efficiencies for Different Planting Dates

Mississippi corn yields have more than tripled in the past 30 years and are increasing faster than any other crop grown in Mississippi. The state average corn yield in 1976 was 41 bushels per acre and in 2004 was 136 bushels per acre. Corn yields have improved substantially from the utilization of new technology, improved genetics, better management and implementation of improved cropping systems. Growers are increasing utilization of crop rotation systems, early planting systems, and irrigated culture. These practices are improving corn health and productivity, despite unpredictable environmental conditions. Thus, corn yields are rapidly improving.

Corn yields in the lower Mississippi Delta region are among the highest in the state (Table 2.1). Growers in this region are traditionally quick to incorporate new technology and innovative management strategies to enhance productivity and profitability of their cropping systems. This cropping region also has considerable irrigation capability, whereas non-Delta regions largely have little or no irrigation capability. Irrigation can supplement corn moisture demands when dry weather persists. This normally enhances corn productivity substantially, since Mississippi summer rainfall can be quite inconsistent and does not normally meet corn water requirements, particularly during grain filling stages.

Corn grain yield levels of 150 bushels per acre for non-irrigated (dryland) culture and 200 bushels per acre for irrigated culture should represent realistic production levels for growers using sound management in the lower Mississippi Delta during the next several years. In fact, Mississippi winners of the National Corn Growers Association Yield Contest produced 224.2 and

223.3 bushels per acre in dryland and irrigated categories respectively in 2004.

Planting corn beyond the optimum time period significantly reduces grain yield potential, so that corn is no longer economically feasible to grow. Corn planted early normally produces higher and much more stable grain yields than late-planted corn, because the crop matures during a period when the climate is normally more temperate and favorable for plant growth. Research studies have shown grain yields of late-planted corn normally diminish about 1% per day, compared to corn planted during the suggested planting dates. Therefore, if corn planting is delayed beyond April 10 or a corn stand is destroyed by inundating rainfall or floodwater, the best option for growers is to plant an alternative crop, such as cotton or soybeans, which have later optimum planting dates than corn. These alternative crops are better adapted to produce during typical Mississippi late-summer environments.

When corn is planted late, crop development is delayed, which substantially increases the likelihood and severity of late-season water and heat stress, and insect and disease pressure, compared to normal plantings. Typical Mississippi summer rainfall is normally insufficient to meet corn water requirements, particularly during July, August and September. Furthermore, high temperatures beginning during early July and extending through late-summer will restrain corn physiological efficiency and can cause extensive pollination failure resulting in little grain production when drought is severe.

Late-season drought stress reduces corn productivity because corn is extremely dependent upon ample moisture and moderate temperatures during initial kernel development stages immediately following tassel and silking. Corn is extremely sensitive to water deficit or any physiological stress during this time, because newly pollinated kernels (reproductive organs) compete poorly with vegetative plant parts for stored energy during this time. This makes kernel development very dependent upon high photosynthetic rate for two weeks after silking.

Table 2.1. Corn grain yields in the Lower Mississippi Delta (NASS-District 40) and the Mississippi State average

	Corn Grain Yield (bushels/acre)	
Year	District 40	State
2004	142.4	136.0
2003	146.1	135.0
2002	125.4	120.0
2001	152.3	130.0
2000	119.5	100.0
1999	136.8	117.0
1998	101.4	86.0
1997	121.8	107.0

Task 3 – Identify Proxy County or Counties Outside the Study Area

Washington County can serve as a proxy for the counties in the lower Mississippi Delta. It is on the northern fringe of the lower Mississippi Delta, and has the same mix of loamy and clayey soils that is common in the other counties. It traditionally has the second largest corn acreage of the seven counties, and has essentially the same weather and climate. It is probably the county that is least affected by flooding that will occur in the lower Delta. Counties outside the Delta are not good proxies because of their topography (rolling, eroded hills), non-alluvial soils (little or no clays), and a relatively no acreage of irrigated corn.

The Delta Research and Extension Center (DREC) and the USDA-ARS Jamie Whitten Delta States Research Center are located in Washington County. The DREC has a Class A weather station and their website provides access to online historic and daily weather data that can be used to upgrade climate and agronomic models. State and federal scientists at the research center are conducting ongoing agronomic research that can be used to validate and/or upgrade yield and production technology for the area. Washington County is also the site of the Delta Conservation and Demonstration Center, where research-proven crop practices and water quality technology are evaluated and monitored under actual farming conditions.

Task 4 - Develop Crop Budgets

Two budgets have been developed which characterize standard production systems for planting corn in the lower Mississippi Delta. The budgets are for irrigated and non-irrigated production systems. All budgets were compiled using the Mississippi State Budget Generator version 6.0. Corn grain yield levels of 150 bushels per acre for non-irrigated culture and 200 bushels per acre for irrigated culture were used for calculating returns. A price of $2.40/bu was used for calculating returns. The 10-year (1995–2004) market year average price is $2.39/bu for Mississippi. Diesel fuel was assigned a cost of $2.23/gal.

Both budgets are developed using minimum tillage/stale seedbed cropping systems using Roundup Ready Corn production systems. The Roundup Ready Corn production system has displaced conventional herbicides as the most popular system in the lower Mississippi Delta. The Roundup Ready Corn production system is rapidly being adopted because it offers protection from off-target movement of glyphosate applied to adjacent Roundup Ready soybean and/or cotton fields or unplanted fields. This is important because Roundup Ready crops are planted on over 95% of the soybean and cotton acreage in the lower Delta. Furthermore, this herbicide system does not restrict replanting options, when glyphosate is applied exclusively, if flooding destroys a planted crop. Both budgets include inputs for controlling Southwestern corn borer, which is a common insect pest in this region. These budgets recognize that not all inputs will be required every year. Thus, the inputs represent best management practices for normal occurrences of common pests and fertility requirements. Irrigation cost is based on applying 13 inches of water per acre.

Inputs and their estimated costs for each system are shown in Tables 2.2 and 2.3. A summary of each system's costs and returns is shown in Table 2.4. Net returns do not include costs for land, management, and general farm overhead.

Table 2.2 (Budget 1). Estimated resource use and costs ($/acre) for field operations for irrigated corn production in the lower Mississippi Delta.

Operation	Times Over	Date	Amount	Cost
Lime (Spread)	0.25	15-Sep	2 tons/a. every 4th yr.	13.00
Dry Fertilizer (Spin Spread)				3.67
Phosphorus	1	16-Sep	83 lbs. P_2O_5/a.	25.20
Potash	1	16-Sep	83 lbs. K_20/a.	17.88
Disk Bed (Hipper)	1	20-Sep		5.49
Roller	1	20-Sep		3.53
Burndown Herbicide (Aerial Spray)	1	1-Feb		3.25
Glyphosate Plus 4L			1 qt/a.	4.58
2,4-D			0.5 qt/a.	1.59
Plant	1	25-Mar		5.75
RR Corn Seed			32000/a.	52.16
Poncho 250 seed trmt				
Fert. App. (Sidedress)	1	20-Apr		6.34
UAN solution (32% N)			100 lbs. N/a.	34.38
Herbicide App. (High clearance sprayer)	1	21-Apr		1.03
Glyphosate Plus 4L			1 qt./a.	4.58
Fert. App. (Sidedress)	1	10-May		6.34
UAN solution (32% N)			160 lbs. N/a.	55.00
Herbicide App. (High clearance sprayer)	1	11-May		1.03
Glyphosate Plus 4L			1 qt./a.	4.58
Irrigation (Roll-out vinyl pipe)	5	May-July	13 a.-in.	62.08
Aerial Spray - 5 gal./a. (Corn Borers)	0.5	25-Jun	Every other year	2.25
Intrepid Insecticide			4 oz./a.	7.32
Combine (8 row - 38")	1	20-Aug		17.57
Grain Cart (700 bu.)				7.72
Haul				32.00
Interest				8.25
Unallocated Labor				5.58
Total Specified Cost				$392.15

*Mississippi State Budget Generator v6.0. Cost of production estimates are based on 2005 input prices.

Table 2.3 (Budget 2). Estimated resource use and costs ($/acre) for field operations for non-irrigated corn production in the lower Mississippi Delta.

Operation	Times Over	Date	Amount	Cost
Lime (Spread)	0.25	15-Sep	2 tons/a every 4th yr.	13.00
Dry Fertilizer (Spin Spread)				3.67
Phosphorus	1	16-Sep	50 lbs. P_2O_5/a.	15.22
Potash	1	16-Sep	50 lbs. K_20/a.	10.79
Disk Bed (Hipper)	1	20-Sep		4.07
Roller	1	20-Sep		3.53
Burndown Herbicide (Aerial Spray)	1	1-Feb		3.25
Glyphosate Plus 4L			1 qt./a.	4.58
2,4-D			0.5 qt./a.	1.59
Plant	1	25-Mar		5.75
Roundup Ready Corn Seed			28000/a.	45.64
Poncho 250 seed trmt				
Fert. App. (Sidedress)	1	20-Apr		6.34
UAN solution (32%)			90 lb. N/a.	30.94
Herbicide App. (High clearance sprayer)	1	21-Apr		1.03
Glyphosate Plus 4L			1 qt./a.	4.58
Fert. App. (Sidedress)	1	10-May		6.34
UAN solution (32%)			100 lb. N/a.	34.38
Herbicide App. (High clearance sprayer)	1	11-May		1.03
Glyphosate Plus 4L			1 qt./a.	4.58
Aerial Spray - 5 gal./a. (Corn Borers)	0.5	25-Jun	Every other year	2.25
Intrepid Insecticide			4 oz./a.	7.32
Combine (8 row - 38")	1	20-Aug		17.57
Grain Cart (700 bu.)				7.72
Haul				24.00
Interest				7.93
Unallocated Labor				5.36
Total Specified Cost				$272.46

*Mississippi State Budget Generator v6.0. Cost of production estimates are based on 2005 input prices.

Table 2.4. Summary of expenses* and returns ($ per acre) for corn production systems in the lower Mississippi Delta.

Budget	Cropping System	Yield (Bu./A.)	Expenses Direct	Fixed	Total	Gross Return	Net Return
1	Irrigated corn production system	200	339.98	52.17	392.15	480.00	87.85
2	Non-irrigated corn production system	150	243.63	28.83	272.46	360.00	87.54

*Excludes costs for land, management, and general farm overhead. Commodity price of $2.40/bushel.

Task 5 – Identify Impacts Associated With Late Planting/Replanting/Alternative Cropping

Inundating rainfall during March and early April often prohibits growers from planting corn in the lower Mississippi Delta. Planted corn fields may also be destroyed by floodwater as well. Therefore, growers must abandon their corn planting intentions and switch to a later-planted crop with better adaptation, such as cotton or soybeans. This restricts the utilization of crop rotation systems using corn in this area.

Corn produces tremendous agronomic and economic benefits when utilized in rotation with other summer crops. The economic impact of crop rotation systems are often overlooked because crop budgets normally focus on inputs and productivity of individual crops during a specific season, rather than multiple crops over several years in a rotation system. However, cotton and soybeans typically yield 10-15% more than monoculture, when grown in rotation with corn on Mississippi farms. Conversely, when inundating rainfall or floodwater restricts corn planting, crop yields for cotton or soybeans planted as alternatives for corn are 10-15% lower than in seasons when they are planted in a scheduled crop rotation system. Thus, depending upon yield level, cotton yields are about 100-180 pounds per acre less and soybean yields 5 – 9 bushels per acre less in a monoculture system, than in a crop rotation system with corn.

Crop rotations normally improve yields because many weed, insect, nematode and disease problems build up when growing the same crop and management system every year. Crop rotation systems effectively eliminate many of these cumulative effects, preventing problems, reducing inputs, raising yields and increasing profitability. Crop rotation allows producers to solve predominant pest problems, including diseases, weeds, nematodes and insects, by simply switching crops, rather than implementing costly inputs.

Corn also produces substantial long-term crop rotation benefits by improving soil physical properties. Corn produces three to four times more plant residue than cotton or soybeans. This plant debris is recycled into the soil as organic matter. Increasing soil organic matter improves soil-properties conducive to plant growth, including increasing the proportion of large soil aggregates, increasing soil-water infiltration and water holding capacity. Increasing soil organic matter content improves soil tilth and structure, which reduces soil crusting and water erosion, and increases soil-water infiltration and soil water and nutrient holding capacity. These soil physical improvements not only improve plant growth, but may also reduce environmental pollution, by reducing runoff and erosion. These improvements also reduce the need for expensive annual deep tillage operations and irrigation.

Numerous other beneficial effects of rotation have been reported, including improvements in soil fertility, soil moisture, soil microbes, and phytotoxic compounds and/or growth promoting substances originating from crop residues. A crop rotation system also spreads risk in case of unpredictable crop-specific problems. Growers can maintain these benefits by continuing to rotate crops on a yearly basis.

Cotton Production in the Lower Mississippi Delta

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Task 1 - Identification of Planting Windows

Planting cotton in the Mississippi Delta varies from north to south due to variations in temperatures. Soil temperatures at the 2-inch level should be 60° F for proper germination and seedling development. Temperatures in the south Delta usually are warmer sooner which will allow for earlier planting in the south Delta, relative to the north Delta. Typically, cotton planting can begin in the south delta as early as April 5. The Delta wide recommendation is for planting to begin somewhere around April 25. While the first two weeks of April can be warm enough for planting, wet field conditions and/or the threat of a late cold front can delay cotton development substantially. Given proper weather conditions, recommended planting dates for cotton are from April 25 through May 20. Given proper weather conditions, some late planting can occur until June 1. However, yield potential for cotton planted beyond May 20, is typically lower than earlier plantings. Plantings beyond June 1 are generally discouraged.

Task 2 - Determined Yields and Irrigation Efficencies for Different Planting Dates

The decision to plant cotton is based on numerous criteria including, but not limited to, weather or environmental conditions, variety, field conditions and logistics of farm operations. While it is recommended and agronomically advantageous to plant as soon as soil temperatures allow, seldom are all these conditions met. As a plant requiring heat unit accumulation for development, cotton depends on plentiful warm days with high light intensity. The optimum window for planting previously described synchronizes these conditions with proper cotton development. Earlier plantings tend to extend the term of liability due to increased exposure to inclement weather and later plantings do not allow sufficient and proper development due to lack of accumulated heat units. Additionally, periods of intense heat and humidity along with dry growing conditions are more harmful to later plantings at critical developmental stages for cotton. Seasonal variations in environment are often the most difficult criteria to determine proper planting date within the given recommended time frame. These variations make it impossible to conclude that any given date is the best day every year. The best time to plant cotton may vary from year to year. However, based upon data provided by Dr. William Meredith, Plant Geneticist with USDA-ARS in Stoneville, cotton yields follow a quadratic response as planting date is delayed beyond March 31. His data indicate that yield follows the equation:

$$Y = 897.20 + 10.33\,X - 0.257\,X^2$$

where Y = lbs of lint per acre and
X = days after March 31

Other earlier works indicate the same response as defined by Meredith. Bridge, et al. concluded that cotton planted between April 17 and April 21 was 6 percent and 21 percent higher in yield than May 1-2 and May 20-22 plantings, respectively. Limited documentation of planting dates for cotton support the general recommended planting interval previously defined. For purposes of this study, the equation provided by Meredith was used to estimate yield for a given planting date. May 2, May 17 and May 27 were chosen to bracket the optimum window for cotton production in the south Delta.

Task 3 - Identify Proxy County or Counties Outside the Study Area

Washington County typifies cotton production for the Mississippi Delta and would be the best county to use as a proxy for the 5 counties in the lower Mississippi Delta affected by the current study. These 5 counties are part of a 7 county area considered as District 40 by the USDA-National Ag Statistics Service for Mississippi. Washington County is centrally located in the Delta and is also on the northern fringe of the study area. A portion of the southern end of the county is actually in the study area. Soil types are typical of the general study area, especially the lower half of the county. In 2004, of the 5 counties involved, it had the largest acreage planted and reported an average yield of 1,114 lbs/A. The 7-county average for District 40 in 2004 was 1,104 lb/A. The five-year average for Washington County and District 40 was 846 and 834 lbs/A, respectively. Sharkey and Issaquena counties, the two counties with the largest acreages affected by the project area have a five-year average of 855 and 834 lb/A, respectively. Other counties in the Delta with high cotton production are too far north to adequately compare cotton production in the study area and counties outside the Delta are not good proxies because of their relative differences in production for the two very distinct regions of the state- Delta and Hill. Almost 75% of cotton production is in the Delta region with the remaining scattered through the Hill region of the state.

The Delta Research and Extension Center (DREC) and the USDA-ARS Jamie Whitten Delta States Research Center are located in Washington County. The DREC has a Class A weather station and their website provides access to online historic and daily weather data that can be used to upgrade climate and agronomic models. Both state and federal scientists at the research center are conducting ongoing agronomic research that can be used to validate and/or upgrade yield and production technology for the area.

Task 4 - Typical Crop Budgets for Expected Planting Dates

Three budgets were developed which characterized standard production systems for planting cotton in the lower Mississippi Delta. The budgets are for non-irrigated production. All budgets were compiled by the MSU Department of Agricultural

Economics using the Mississippi State Budget Generator version 6.0.

Conservation tillage budgets were developed assuming use of 8-row equipment and solid planted Roundup Ready/Bollgard cottonseed. All budgets include similar inputs and were adjusted for the variations in planting date and estimated crop development for each planting date considered. Budgets were designed for planting dates of May 2, May 17 and May 27, which bracket the optimum-planting window for cotton in the area. Accepted management practices for the study area were considered for each budget. Cotoran was included as a weed control cost in the budgets but Staple was not. Use of one of these herbicides normally precludes the use of the other due to similar weed spectrums controlled. Inputs and their estimated costs for each system are shown in the attached tables (3.1, 3.2 & 3.3).

Evidence of a reliable benefit to irrigation for cotton in not well documented. As a result, cotton irrigation is considered an option to maintaining acceptable economic yield but not necessarily a requirement, as is the case with corn or soybeans. Since supplemental irrigation is not always necessary to achieve acceptable economic yield, complete budgets that include irrigation costs are not published. Thus, irrigation costs were considered separately in an additive budget (Table 3.5).

Task 5 - Impacts Associated With Late Planting/Replanting/Alternative Cropping

Alleviating the potential for flooding in the study area would affect cotton production several ways. First, planting dates would be earlier than the typical late April date considered in the current study. The lower Delta enjoys warmer temperatures earlier than the Delta area in general. However, the larger area of wet field conditions from late winter flooding and the risk associated with early spring flooding are major factors in the decision to begin planting relative to areas that are not flood prone. Second, field conditions deteriorate as the fall harvest season progresses and wetter field conditions become more frequent leaving fewer days suitable for fieldwork. Late harvests, which are associated with late planting, increase the risk of crop losses due to excessive weathering or field conditions prohibiting use of harvesting equipment. This is in addition to the assumed reduced yield potential of later plantings.

Due to the high cost of planting in today's cotton production systems, replanting has become cost prohibitive. As a result, planting is typically begun when all risks associated with getting a stand are minimal. Risks are never completely eliminated, but meeting the criteria as described earlier tends to minimize these risks. Flooding, or wet field conditions as a result of flooding, skews risk management decisions into less desirable time frames, thereby increasing the potential for losses. Replanting is considered a last resort and is still confined to the recommended planting dates for the area.

Should crop loss occur outside the recommended planting dates, soybeans would be the only suitable alternative provided herbicide use in the cotton portion of the season does not preclude their use. Typical herbicide use in the Roundup Ready system would not affect the decision to plant soybeans after a cotton crop loss, but certain weed situations require use of herbicides such as Staple or Cotoran that would detrimentally affect soybean establishment. As a result, cotton would be the only thing that could be replanted in these areas. If the cotton crop loss occurred after June 1, these areas would most likely be considered a total loss. Consult label specifications for replanting restrictions.

The data in Table 3.4 summarizes the impact of delayed and/or late planting on yields, gross returns and net returns. The impacts are substantial.

Table 3.1. Estimated resource use and costs for field operations, per acre Cotton, 8R-38" solid, plnt May 2nd Conservation tillage, BtRR variety, Delta Area, Mississippi

Operation/Operating Input	Size/Unit	Times Over	MTH	Amount	Total Cost
Lime (Spread)	ton	0.25	Nov	0.5000	$13.00
Phosphorus (46% P205)	cwt			0.1750	2.45
Stalk Shredder	14'	1.00	Nov		8.99
Paratill & Bed Fold.	8R-38	1.00	Nov		7.63
Spin Spreader	5 ton	1.00	Mar		3.67
Potash (60% K2O)	cwt			1.5000	19.50
Fert Appl (Liquid)	8R-38	1.00	Mar		6.34
UAN (32% N)	cwt			2.0000	22.00
Sprayer (600-750gal)	60'	1.00	Apr		1.70
Roundup WeatherMax	oz			22.0000	9.02
Row Cond (Plant)	27'	0.50	Apr		2.83
Plant & Pre Rigid	8R-38	1.00	May		7.65
Cotoran 4L	pt			1.5000	6.90
BG/RR Cot Tech Fee	cap/ac			1.0000	48.00
Cotton Seed BtRR	thous			52.5000	18.90
Temik 15G Gypsum	lb			3.5000	12.29
Fungicide	lb			8.0000	18.64
Insect Scouting	acre	1.00	May	1.0000	7.00
Eradication Fee	acre			1.0000	5.80
Sprayer (600-750gal)	60'	1.00	May		1.70
Orthene 90S	lb			0.2200	2.33
Roundup WeatherMax	oz			22.0000	9.02
Sprayer (600-750gal)	60'	0.50	May		0.84
Roundup WeatherMax	oz			11.0000	4.51
Sprayer (600-750gal)	60'	1.00	Jun		1.70
Centric 40WG	oz			2.0000	9.42
Mepex	oz			6.0000	2.88
Fert Appl (Liquid)	8R-38	1.00	Jun		6.34
UAN (32%N)	cwt			2.0000	22.00
Spray (Direct/Layby)	8R-38	1.00	Jul		4.82
Karmex DF	lb			1.0000	4.20
Roundup WeatherMax	oz			22.0000	9.02
Surfactant	pt			0.20000	0.31
Sprayer (600-750gal)	60'	1.00	Jul		1.70
Bidrin 8L	oz			6.0000	4.26
Mepex	oz			16.0000	7.68
App by Air (2gal)	appl	1.00	Jul	1.0000	2.80
Karate Z	oz			2.0000	6.04
App by Air (2gal)	appl	1.00	Aug	1.0000	2.80
Orthene 90S	lb			0.5500	5.81
App by Air (5gal)	appl	1.00	Sep	1.0000	4.50
Dropp SC	oz			2.0000	7.92
Ethephon 6E	pt			1.3300	9.06
Cotton Picker-1st-BB	4R-38(325)	1.00	Oct		81.98
Boll Buggy-1st pick	4R-38(325)	1.00	Oct		21.22
Module Builder-1st	4R-38(325)	1.00	Oct		24.59
Haul Cotton	lb	1.00	Oct	964.0000	19.28
Gin	lb	1.00	Oct	964.0000	77.12
Totals					578.16
Interest on Operating Capital					12.79
Unallocated Labor					11.74
Total Specified Cost					$602.69

Note: Cost of production estimates are based on 2005 input prices.

Table 3.2. Estimated resource use and costs for field operations, per acre Cotton, 8R-38" solid, plnt May 17th
Conservation tillage, BtRR variety, Delta Area, Mississippi

Operation/Operating Input	Size/Unit	Times Over	MTH	Amount	Total Cost
Lime (Spread)	ton	0.25	Nov	0.5000	$13.00
Phosphorus (46% P205)	cwt			0.1750	2.45
Stalk Shredder	14'	1.00	Nov		8.99
Paratill & Bed Fold.	8R-38	1.00	Nov		7.63
Spin Spreader	5 ton	1.00	Mar		3.67
Potash (60% K2O)	cwt			1.5000	19.50
Fert Appl (Liquid)	8R-38	1.00	Mar		6.34
UAN (32% N)	cwt			2.0000	22.00
Sprayer (600-750gal)	60'	1.00	Apr		1.70
Roundup WeatherMax	oz			22.0000	9.02
Row Cond (Plant)	27'	0.50	Apr		2.83
Plant & Pre Rigid	8R-38	1.00	May		7.65
Cotoran 4L	pt			1.5000	6.90
BG/RR Cot Tech Fee	cap/ac			1.0000	48.00
Cotton Seed BtRR	thous			52.5000	18.90
Temik 15G Gypsum	lb			3.5000	12.29
Fungicide	lb			8.0000	18.64
Insect Scouting	acre	1.00	May	1.0000	7.00
Eradication Fee	acre			1.0000	5.80
Sprayer (600-750gal)	60'	1.00	May		1.70
Orthene 90S	lb			0.2200	2.33
Roundup WeatherMax	oz			22.0000	9.02
Sprayer (600-750gal)	60'	0.50	May		0.84
Roundup WeatherMax	oz			11.0000	4.51
Sprayer (600-750gal)	60'	1.00	Jun		1.70
Centric 40WG	oz			2.0000	9.42
Mepex	oz			6.0000	2.88
Fert Appl (Liquid)	8R-38	1.00	Jun		6.34
UAN (32%N)	cwt			2.0000	22.00
Spray (Direct/Layby)	8R-38	1.00	Jul		4.82
Karmex DF	lb			1.0000	4.20
Roundup WeatherMax	oz			22.0000	9.02
Surfactant	pt			0.20000	0.31
Sprayer (600-750gal)	60'	1.00	Jul		1.70
Bidrin 8L	oz			6.0000	4.26
Mepex	oz			16.0000	7.68
App by Air (2gal)	appl	1.00	Jul	1.0000	2.80
Karate Z	oz			2.0000	6.04
App by Air (2gal)	appl	1.00	Aug	1.0000	2.80
Orthene 90S	lb			0.55000	5.81
App by Air (5gal)	appl	1.00	Oct	1.0000	4.50
Dropp SC	oz			2.0000	7.92
Ethephon 6E	pt			1.3300	9.06
Cotton Picker-1st-BB	4R-38(325)	1.00	Oct		81.98
Boll Buggy-1st pick	4R-38(325)	1.00	Oct		21.22
Module Builder-1st	4R-38(325)	1.00	Oct		24.59
Haul Cotton	lb	1.00	Oct	815.0000	16.30
Gin	lb	1.00	Oct	815.0000	65.20
Totals					563.26
Interest on Operating Capital					12.59
Unallocated Labor					11.74
Total Specified Cost					$587.59

Note: Cost of production estimates are based on 2005 input prices.

Table 3.3. Estimated resource use and costs for field operations, per acre Cotton, 8R-38" solid, plnt May 27th
Conservation tillage, BtRR variety, Delta Area, Mississippi

Operation/Operating Input	Size/Unit	Times Over	MTH	Amount	Total Cost
Lime (Spread)	ton	0.25	Dec	0.5000	$13.00
Phosphorus (46% P205)	cwt			0.1750	2.45
Stalk Shredder	14'	1.00	Dec		8.99
Paratill & Bed Fold.	8R-38	1.00	Dec		7.63
Spin Spreader	5 ton	1.00	Mar		3.67
Potash (60% K2O)	cwt			1.5000	19.50
Fert Appl (Liquid)	8R-38	1.00	Mar		6.34
UAN (32% N)	cwt			2.0000	22.00
Sprayer (600-750gal)	60'	1.00	May		1.70
Roundup WeatherMax	oz			22.0000	9.02
Row Cond (Plant)	27'	0.50	May		2.83
Plant & Pre Rigid	8R-38	1.00	May		7.65
Cotoran 4L	pt			1.5000	6.90
BG/RR Cot Tech Fee	cap/ac			1.0000	48.00
Cotton Seed BtRR	thous			52.5000	18.90
Temik 15G Gypsum	lb			3.5000	12.29
Fungicide	lb			8.0000	18.64
Insect Scouting	acre	1.00	May	1.0000	7.00
Eradication Fee	acre			1.0000	5.80
Sprayer (600-750gal)	60'	1.00	Jun		1.70
Orthene 90S	lb			0.2200	2.33
Roundup WeatherMax	oz			22.0000	9.02
Sprayer (600-750gal)	60'	0.50	Jun		0.84
Roundup WeatherMax	oz			11.0000	4.51
Sprayer (600-750gal)	60'	1.00	Jun		1.70
Centric 40WG	oz			2.0000	9.42
Mepex	oz			6.0000	2.88
Fert Appl (Liquid)	8R-38	1.00	Jun		6.34
UAN (32%N)	cwt			2.0000	22.00
Spray (Direct/Layby)	8R-38	1.00	Jul		4.82
Karmex DF	lb			1.0000	4.20
Roundup WeatherMax	oz			22.0000	9.02
Surfactant	pt			0.20000	0.31
Sprayer (600-750gal)	60'	1.00	Aug		1.70
Bidrin 8L	oz			6.0000	4.26
Mepex	oz			16.0000	7.68
App by Air (2gal)	appl	1.00	Aug	1.0000	2.80
Karate Z	oz			2.0000	6.04
App by Air (2gal)	appl	1.00	Aug	1.0000	2.80
Orthene 90S	lb			0.55000	5.81
App by Air (5gal)	appl	1.00	Oct	1.0000	4.50
Dropp SC	oz			2.0000	7.92
Ethephon 6E	pt			1.3300	9.06
Cotton Picker-1st-BB	4R-38(325)	1.00	Nov		81.98
Boll Buggy-1st pick	4R-38(325)	1.00	Nov		21.22
Module Builder-1st	4R-38(325)	1.00	Nov		24.59
Haul Cotton	lb	1.00	Nov	651.0000	13.02
Gin	lb	1.00	Nov	651.0000	52.08
Totals					546.86
Interest on Operating Capital					13.99
Unallocated Labor					11.74
Total Specified Cost					$572.59

Note: Cost of production estimates are based on 2005 input prices.

Table 3.4: Summary of Costs* and Returns ($ Per Acre) for Cotton Production in the Lower Mississippi Delta

Table	Description	Yield (lbs/Acre)	Costs Direct	Costs Fixed	Costs Total	Gross Return	Net Return
3.1	Non-irrigated late April/early May planting	964	499	103	602	603	1
3.2	Non-irrigated early May/mid-May planting	815	484	103	587	510	-77
3.3	Non-irrigated mid-May/late May planting	651	469	103	572	408	-164

*Excludes costs for land, management, and general farm overhead. Commodity price of 56¢/lb. for lint and 4¢/lb. for seed. Cost estimates are based on 2005 input prices

Table 3.5. Estimated resource use and costs for field operations, per acre Irrigated cotton, added costs/practices 160-acre roll-out pipe system, 10.5 ac-in., Delta Area, Mississippi

Operation/Operating Input	Size/Unit	Times Over	MTH	Amount	Total Cost
Land Plane	50'x16'	0.25	Oct		$2.53
Disk Bed (Hipper) Rdg	8R-38	0.25	Mar		1.37
Set Up Engine		1.00	May		
IRRIGATE LABOR	hour				0.16
Ditcher (1m/160a)		1.00	Jun		0.44
UAN (32% N)	cwt	1.00	Jun	0.3000	3.30
Roll-Out Pipe	ft	1.00	Jun	33.0000	6.93
Lay Roll-Out Pipe		4.00	Jun		
Pipe Spool 160ac	¼ m roll				0.95
IRRIGATE LABOR	hour				1.29
Apply Water		1.00	Jun		
IRRIGATE LABOR	hour				0.16
App by Air (3gal)	appl	1.00	Jun	1.0000	3.25
Mepiquat Chloride	oz			8.0000	5.04
Apply Water		1.00	Jul		
IRRIGATE LABOR	hour				0.16
App by Air (3gal)	appl	0.50	Jul	0.5000	1.63
Incidental Pest Trt	acre			0.5000	6.00
Apply Water		1.00	Aug		
IRRIGATE LABOR	hour				0.16
Pick Up Pipe		6.00	Sep		
Pipe Spool 160ac	¼ m roll				1.41
Land Forming ($240)	each	1.00	Jan	1.0000	20.59
Well & Pump, Furrow	each	1.00	Jun	0.0062	8.24
Main Line Pipe	each	1.00	Jun	0.0062	4.14
Engine, RPF, 75	each	1.00	Jun	0.0062	4.72
Application 1	ac-in			3.5000	6.99
Application 2	ac-in			3.5000	6.99
Application 3	ac-in			3.5000	6.99
Totals					93.44
Interest on Operating Capital					1.38
Unallocated Labor					0.00
Total Specified Cost					$94.82

Note: Cost of production estimates are based on 2005 input prices.