Farm Budget Implications of Dicamba Ruling

MISSISSIPPI STATE UNIVERSITY EXTENSION

The use of dicamba herbicides for controlling weeds in cotton and soybeans has been widely debated for several years due to potential drift concerns with their use. However, dicamba has proven to be effective in controlling Palmer amaranth, which has become resistant to herbicides such as glyphosate. The ruling by the Ninth Circuit Court of Appeals in June 2020 to vacate the registrations of three herbicides—Xtendimax, Engenia, and FeXapan, which are labeled for use in XtendFlex® cotton and Xtend® soybeans—has led to concerns about the herbicide options available to control herbicide-resistant weeds. There is also a need to determine how this ruling may affect the financial outlook of farmers growing dicamba-resistant crops.

The Mississippi State University Department of Agricultural Economics has created budgets that would demonstrate the changes in revenue and expenses incurred if farmers move to different herbicide options. For all budgets, direct expenses represent variable expenses that are incurred only through crop production. Fixed expenses represent costs that are incurred even if no crops are grown, such as tractor and implement costs. Total specified expenses include all direct and fixed expenses.

Tables 1–3 are representative budgets of a farm growing soybeans using furrow irrigation in the Delta area of Mississippi. Table 1 is a budget with approved dicamba formulations. Table 2 represents an alternative budget where PPO (Protoporphyrinogen Oxidase) herbicides such as fomesafen are used for postemergence weed control instead of dicamba. The trade name for the fomesafen herbicide used in this publication is Prefix. However, Palmer amaranth is becoming resistant to several herbicides, especially glyphosate. Therefore, Table 3 examines a growing situation with no postemergence herbicide options for controlling Palmer amaranth. In this scenario, Palmer amaranth control is provided by various preemergent herbicides such as dimethenamid-P. The trade name for the dimethenamid-P herbicide used in this publication is Outlook.

Table 1. Estimated costs and returns per acre for soybeans with the use of dicamba, Mississippi Delta, 2020.[1]

Income	Unit	Price ($)	Quantity	Total ($)
Soybeans	bushel	8.20	60	492.00
Total income				492.00
Direct expenses				
Custom spray	acre	35.00	1	35.00
Harvest aids	acre	6.64	1	6.64
Fertilizers	acre	52.34	1	52.34
Fungicides	acre	23.21	1	23.21
Herbicides	acre	96.44	1	96.44
Insecticides	acre	13.69	1	13.69
Irrigation supplies	acre	7.92	1	7.92
Seed/Plants	acre	66.00	1	66.00
Adjuvants	acre	5.84	1	5.84
Custom fertilizer	acre	7.50	1	7.50
Hauling	bushel	0.27	60	16.20
Custom lime	acre	14.32	1	14.32
Crop consultant	acre	6.50	1	6.50
Inoculant	acre	1.55	1	1.55
Soil test	acre	3.33	1	3.33
Operator labor	hour	15.22	0.5748	8.75
Irrigate labor	hour	9.06	0.36	3.29
Hand labor	hour	9.06	0.0959	0.87
Unallocated labor	hour	15.25	0.4467	6.81
Diesel fuel	gallon	2.30	14.2443	32.76
Repair and maintenance	acre	31.54	1	31.54
Total direct expenses				440.50
Returns above direct expenses				51.50
Total fixed expenses				112.69
Total specified expenses				553.19
Returns above total specified expenses				(61.19)

[1]Full season, RR2X, stale seedbed, 12R 30", furrow irrigated 9 acre inches.

Table 1, which includes approved dicamba formulations, shows lower returns than the alternative budget with no dicamba application (Table 2) by $8.54 per acre. Table 3, which covers the absence of postemergence control of Palmer amaranth, has the lowest returns of all the soybean budgets. Returns in this scenario were $29.30 per acre less than the approved dicamba formulations (Table 1), and $38.03 per acre less than the alternative budget that used fomesafen for weed control (Table 2). The budgets assume that there are no yield differences between different herbicide options since Norsworthy et al. (2008) and Barkely et al. (2016) found that Palmer amaranth can be effectively controlled by fomesafen. Sarangi and Jhala (2019) also note that the use of dimethenamid-P alongside other herbicides is effective in controlling Palmer amaranth and various other weeds in soybeans. However, if Palmer amaranth is not sufficiently controlled, or it builds resistance to fomesafen, then yield losses could occur. For all growing situations, returns above total specified expenses are negative due to the estimated prices received for each crop.

The difference in returns between the three budget situations is primarily due to herbicide costs. The herbicides used and the respective estimated costs for each situation is presented in Table 4. The lowest herbicide expenses are incurred with soybeans with no approved dicamba formulations, at a cost of $87.90 per acre. Herbicide expenses with approved dicamba formulations are slightly higher at $96.44 per acre. The herbicide Engenia was considered to be the favored herbicide used according to Extension specialists, and its higher cost compared to other herbicides is the main driver for the higher expenses incurred for this growing situation. The highest herbicide expenses are seen when there are no postemergence options for controlling Palmer amaranth. In this scenario, herbicide costs would be $121.50 per acre. These budgets are only an estimate of the costs, so costs may vary from producer to producer.

Table 5 and Table 6 are representative budgets of a farm growing cotton using furrow irrigation in the Delta area of Mississippi. Table 5 represents a growing situation with approved dicamba formulations, whereas Table 6 represents a situation in which glufosinate is used in place of dicamba. Table 5 has slightly higher returns above total specified expenses when compared to Table 6, but the difference is miniscule. Yield estimates of each table are the same since Barnett et al. (2013) and Cahoon et al. (2015) note that effective control of Palmer amaranth can be achieved

Table 2. Estimated costs and returns per acre for soybeans with no dicamba application, Mississippi Delta, 2020.[1]

Income	Unit	Price ($)	Quantity	Total ($)
Soybeans	bushel	8.20	60	492.00
Total income				492.00
Direct expenses				
Custom spray	acre	35.00	1	35.00
Harvest aids	acre	6.64	1	6.64
Fertilizers	acre	52.34	1	52.34
Fungicides	acre	23.21	1	23.21
Herbicides	acre	87.90	1	87.90
Insecticides	acre	13.69	1	13.69
Irrigation supplies	acre	7.92	1	7.92
Seed/Plants	acre	66.00	1	66.00
Adjuvants	acre	5.84	1	5.84
Custom fertilizer	acre	7.50	1	7.50
Hauling	bushel	0.27	60	16.20
Custom lime	acre	14.32	1	14.32
Crop consultant	acre	6.50	1	6.50
Inoculant	acre	1.55	1	1.55
Soil test	acre	3.33	1	3.33
Operator labor	hour	15.22	0.5748	8.75
Irrigate labor	hour	9.06	0.36	3.29
Hand labor	hour	9.06	0.0959	0.87
Unallocated labor	hour	15.25	0.4467	6.81
Diesel fuel	gallon	2.30	14.2443	32.76
Repair and maintenance	acre	31.35	1	31.35
Total direct expenses				431.77
Returns above direct expenses				60.23
Total fixed expenses				112.69
Total specified expenses				544.46
Returns above total specified expenses				(52.46)

[1]Full season, RR2X, stale seedbed, 12R 30", furrow irrigated 9 acre inches.

by the use of glufosinate. However, both the soybean and cotton budgets are representative, so an individual farmer's situation may vary from what is found here.

Table 7 depicts the changes in herbicides used and their respective estimated costs for each cotton budget. In contrast with soybean production, cotton production that uses dicamba had lower herbicide costs than production with no dicamba application. However, the differences in herbicide expenses are small; cotton grown using glufosinate instead of dicamba have herbicide expenses $0.66 more per acre than cotton grown with dicamba applications.

Although the registrations for certain dicamba herbicides have been vacated, options for growing cotton and soybeans are still available. The budgets presented show that changes in herbicides used have a minimal effect on the estimated returns of each crop, with some growing situations offering a higher return when compared to using approved dicamba herbicides. However, if herbicide resistance in Palmer amaranth continues to increase, then herbicide costs will increase significantly, and returns will be severely impacted. Yield losses in this scenario would compound this issue leading to a further decrease in returns.

Table 3. Estimated costs and returns per acre for soybeans with no postemergence Palmer amaranth control, Mississippi Delta, 2020.[1]

Income	Unit	Price ($)	Quantity	Total ($)
Soybeans	bushel	8.20	60	492.00
Total income				492.00
Direct expenses				
Custom spray	acre	35.00	1	35.00
Harvest aids	acre	6.64	1	6.64
Fertilizers	acre	52.34	1	52.34
Fungicides	acre	23.21	1	23.21
Herbicides	acre	121.50	1	121.50
Insecticides	acre	13.69	1	13.69
Irrigation supplies	acre	7.92	1	7.92
Seed/Plants	acre	66.00	1	66.00
Adjuvants	acre	5.84	1	5.84
Custom fertilizer	acre	7.50	1	7.50
Hauling	bushel	0.27	60	16.20
Custom lime	acre	14.32	1	14.32
Crop consultant	acre	6.50	1	6.50
Inoculant	acre	1.55	1	1.55
Soil test	acre	3.33	1	3.33
Operator labor	hour	15.22	0.603	9.18
Irrigate labor	hour	9.06	0.36	3.29
Hand labor	hour	9.06	0.11	1.00
Unallocated labor	hour	15.25	0.4721	7.20
Diesel fuel	gallon	2.30	14.571	33.51
Repair and maintenance	acre	32.45	1	32.45
Total direct expenses				468.17
Returns above direct expenses				23.83
Total fixed expenses				60.69
Total specified expenses				114.32
Returns above total specified expenses				(90.49)

[1]Full season, RR2X, stale seedbed, 12R 30", furrow irrigated 9 acre inches.

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Table 4. Herbicides applied for soybean production when dicamba is applied, when fomesafen is used in place of dicamba, and when no postemergence options are available for Palmer amaranth.

Soybeans with dicamba application			
Herbicides	**Quantity**	**Price ($/unit)**	**Cost ($/acre)**
Glyphosate 3 lb a.e	96 oz	0.14	13.44
2,4-D Amine 4	2 pt	2.73	5.46
Select Max	1 pt	10.87	10.87
Valor SX	2 oz	4.28	8.56
Boundary	2 pt	8.84	17.68
Gramoxone SL 2.0	48 oz	0.17	8.16
Zidua DF	1.5 oz	8.23	12.35
Engenia	24 oz	0.83	19.92
Total herbicide cost			96.44
Soybeans with no dicamba application			
Herbicides	**Quantity**	**Price ($/unit)**	**Cost ($/acre)**
Glyphosate 3 lb a.e	96 oz	0.14	13.44
2,4-D Amine 4	2 pt	2.73	5.46
Select Max	1 pt	10.87	10.87
Valor SX	2 oz	4.28	8.56
Boundary	2 pt	8.84	17.68
Gramoxone SL 2.0	48 oz	0.17	8.16
Prefix	2 pt	5.69	11.38
Zidua DF	1.5 oz	8.23	12.35
Total herbicide cost			87.90
Soybeans with no postemergence options for palmer amaranth			
Herbicides	**Quantity**	**Price ($/unit)**	**Cost ($/acre)**
Glyphosate 3 lb a.e	128 oz	0.14	17.92
2,4-D Amine 4	2 pt	2.73	5.46
Select Max	1 pt	10.87	10.87
Valor SX	2 oz	4.28	8.56
Boundary	2 pt	8.84	17.68
Gramoxone SL 2.0	48 oz	0.17	8.16
Warrant	6 pt	4.02	24.12
Zidua DF	1.5 oz	8.23	12.35
Outlook	1 pt	16.38	16.38
Total herbicide cost			121.50

Table 5. Estimated costs and returns per acre for cotton with dicamba application, Mississippi Delta, 2020.[1]				
Income	**Unit**	**Price ($)**	**Quantity**	**Total ($)**
Cotton lint	pound	0.54	1500	810.00
Cotton seed	pound	0.10	2025	202.50
Total income				1,012.50
Direct expenses				
Custom spray	acre	49.13	1	49.13
Harvest aids	acre	13.73	1	13.73
Ginning	pound	0.11	1500	165.00
Fertilizers	acre	93.13	1	93.13
Fungicides	acre	20.00	1	20.00
Herbicides	acre	91.09	1	91.09
Insecticides	acre	84.25	1	84.25
Irrigation supplies	acre	7.92	1	7.92
Seed/Plants	acre	105.30	1	105.30
Growth regulators	acre	5.10	1	5.10
Adjuvants	acre	2.12	1	2.12
Custom fertilizer	acre	7.50	1	7.50
Eradication fee	acre	1.00	1	1.00
Custom lime	acre	28.64	1	28.64
Crop consultant	acre	8.00	1	8.00
Soil test	acre	3.33	1	3.33
Operator labor	hour	15.22	0.7101	10.81
Irrigate labor	hour	9.06	0.3625	3.29
Hand labor	hour	9.06	0.3135	2.84
Unallocated labor	hour	15.18	0.5053	7.67
Diesel fuel	gallon	2.30	19.074	43.86
Repair and maintenance	acre	57.14	1	57.14
Total direct expenses				810.85
Returns above direct expenses				201.65
Total fixed expense				194.02
Total specified expenses				1,004.87
Returns above total specified expenses				7.63

[1]12R-38" solid, conservation tillage, furrow irrigation for B3XF/W3FE variety at 10.5 acre inches.

Table 6. Estimated costs and returns per acre for cotton with no dicamba application, Mississippi Delta, 2020.				
Income	**Unit**	**Price ($)**	**Quantity**	**Total ($)**
Cotton lint	pound	0.54	1,500	810.00
Cotton seed	pound	0.10	2,025	202.50
Total income				1,012.50
Direct expenses				
Custom spray	acre	49.13	1	49.13
Harvest aids	acre	13.73	1	13.73
Ginning	pound	0.11	1,500	165.00
Fertilizers	acre	93.13	1	93.13
Fungicides	acre	20.00	1	20.00
Herbicides	acre	91.75	1	91.75
Insecticides	acre	84.25	1	84.25
Irrigation supplies	acre	7.92	1	7.92
Seed/Plants	acre	105.30	1	105.30
Growth regulators	acre	5.10	1	5.10
Adjuvants	acre	2.12	1	2.12
Custom fertilizer	acre	7.50	1	7.50
Eradication fee	acre	1.00	1	1.00
Custom lime	acre	28.64	1	28.64
Crop consultant	acre	8.00	1	8.00
Soil test	acre	3.33	1	3.33
Operator labor	hour	15.22	0.7101	10.81
Irrigate labor	hour	9.06	0.3625	3.29
Hand labor	hour	9.06	0.3135	2.84
Unallocated labor	hour	15.18	0.5053	7.67
Diesel fuel	gallon	2.30	19.074	43.86
Repair and maintenance	acre	57.05	1	57.05
Total direct expenses				811.42
Returns above direct expenses				201.08
Total fixed expenses				194.02
Total specified expenses				1,005.44
Returns above total specified expenses				7.06
[1]12R-38" solid, conservation tillage, furrow irrigation for B3XF/W3FE variety at 10.5 acre inches.				

Table 7. Herbicides applied for cotton production when dicamba is applied and when no dicamba is applied.			
Cotton with dicamba application			
Herbicides	**Quantity**	**Price ($/unit)**	**Cost ($/acre)**
Clarity	0.5 pt	11.60	5.80
Glyphosate 3 lb a.e	88 oz	0.14	12.32
Select Max	1 pt	10.87	10.87
Gramoxone SL 2.0	48 oz	0.17	8.16
Cotoran	2 pt	5.85	11.70
Dual Magnum	1 pt	10.26	10.26
Warrant	3 pt	4.02	12.06
Engenia	24 oz	0.83	19.92
Total herbicide cost			91.09
Cotton with no dicamba application			
Herbicides	**Quantity**	**Price ($/unit)**	**Cost ($/acre)**
Clarity	0.5 pt	11.60	5.80
Glyphosate 3 lb a.e	32 oz	0.14	4.48
Select Max	1 pt	10.87	10.87
Gramoxone SL 2.0	48 oz	0.17	8.16
Cotoran	2 pt	5.85	11.70
Dual Magnum	1 pt	10.26	10.26
Liberty 280	58 oz	0.49	28.42
Warrant	3 pt	4.02	12.06
Total herbicide cost			91.75

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