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Crawfish Production: Financial Characteristics and Record-Keeping Options

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Crawfish production is economically important to the southeastern United States, particularly in southern Louisiana. *Louisiana Summary* (2010) identified 1,202 crawfish farms in the state, with 184,315 acres in production. Total gross farm value of crawfish was more than $168 million. According to the 2005 U.S. Census of Aquaculture, Louisiana accounted for 96.4 percent of U.S. crawfish sales. Crawfish are harvested in both wild-caught and cultured farming situations, with wild-caught claiming approximately 12 percent of the sales (*Louisiana Summary,* 2010). Most U.S.-produced crawfish is sold live, with a smaller amount sold as fresh tailmeat. The U.S. fresh crawfish tailmeat market, however, has been reduced substantially in recent years with the import of frozen crawfish tailmeat from China. In 2010 and 2011, for example, 8,611 and 2,346 metric tons, respectively, of crawfish products were imported into the U.S. (U.S. Department of Commerce, 2011). This publication concentrates on the financial characteristics of farm-raised crawfish production. Most farm-raised crawfish are red swamp crawfish (*Procambarus clarkii*), with some white river crawfish (*P. zonangulus*).

Crawfish production differs from most other aquacultural enterprises in several important ways. First, the primary feed for crawfish is forage; formulated feeds are not commonly used. Second, because crawfish must have plant material on which to forage, crawfish are often double-cropped or rotated with other field crops, most commonly rice but also soybeans, sorghum, and others. Third, crawfish production is highly seasonal, which prevents the fresh product from being marketed year-round. Because of both the seasonality and the changes in (primarily) supply and (secondarily) demand for crawfish from year to year, the farm-level price for crawfish is highly variable.

In this report, we identify the major crawfish production systems and their frequency of use in Louisiana, provide 2010 estimates of production costs for three of the major systems, discuss recommended record-keeping systems for crawfish production, and offer general conclusions about the financial characteristics of crawfish production.

Major crawfish production systems

A variety of crawfish production systems are found in the southeastern U.S. A 2008 survey sent by the Louisiana State University Agricultural Center to all known Louisiana crawfish farmers showed the use of each of six major production systems (Table 1). Survey results suggested the system most farmers use is single-crop crawfish with rice forage. This is followed by roughly equal numbers of farmers using 1) rice-crawfish double-crop, 2) rice-crawfish-fallow rotation, and 3) single-crop crawfish with a non-planted forage crop. However, the survey also showed that most of the crawfish production land is in either the rice-crawfish double-crop system or rice-crawfish-fallow rotation, with 26 percent of the land in each. Because acreages of single-crop crawfish with rice forage are relatively small, this system accounts for only 12 percent of the land even though 45 percent of the farmers use the system. Based upon these numbers, we present three cost estimates as found in Boucher and Gillespie (2011): rice-crawfish double-crop, rice-crawfish-fallow rotation, and single-crop crawfish with rice forage.

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Table 1. Systems used in Louisiana crawfish production, 2008.

Production system		Description*	Percent of farmers using	Percent of land in system
Rice-crawfish double-crop with rice forage	July–Aug.	Rice harvested and stubble managed for regrowth.	28	26
	Sept.–Oct.	Pond flooded and water monitored and managed.		
	Nov.–Dec.	Crawfish harvested when catch can be economically justified.		
	Jan.–Feb.	Crawfish harvested 2 to 4 days per week when economically justified.		
	Mar.–Apr.	Crawfish harvested 3 to 5 days per week until late April when economically justified.		
	May–June	Pond drained and readied for planting. Rice planted and managed for grain production.		
Rice-crawfish-fallow rotation (2-year rotation)	July–Aug.	Rice harvested and stubble managed for regrowth.	27	26
	Sept.–Oct.	Pond flooded and water monitored and managed.		
	Nov.–Dec.	Water quality monitored and managed.		
	Jan.–Feb.	Crawfish harvested 2 to 4 days per week when economically justified.		
	Mar.–Apr.	Crawfish harvested 3 to 5 days per week when economically justified.		
	May–June	Pond drained and then left fallow.		
	July–May	Rice planted after March–April. Crawfish stocked in May. Repeat cycle.		
Rice-crawfish-soybeans rotation (2-year rotation)	July–May	Same as rice-crawfish-fallow rotation.	7	10
	May–June	Pond drained and soybeans planted.		
	July–May	Harvest soybeans in Oct., plant rice in Mar.–Apr., stock crawfish in May. Repeat cycle.		
Single-crop crawfish with rice forage	July–Aug.	Rice planted.	45	12
	Sept.–Oct.	Pond flooded and water monitored and managed.		
	Nov.–Dec.	Harvest when catch can be economically justified.		
	Jan.–Feb.	Crawfish harvested 2 to 4 days per week when economically justified.		
	Mar.–Apr.	Crawfish harvested 3 to 5 days per week when economically justified.		
	May-Jun	Crawfish harvested until catch no longer justified.		
Single-crop crawfish with other planted forage	July–Aug.	Other forage planted.	11	8
	Sept.–June	Same as single-crop crawfish with rice forage.		
Single-crop crawfish with non-planted forage crop	July–June	Same as single-crop crawfish with rice forage except no rice planted in July–Aug.	27	18

*Descriptions are taken from Table 3.1, Louisiana State University *Louisiana Crawfish Manual,* 2007.

Costs associated with the other systems can be determined through partial budgeting using these budgets, such as substituting another forage for rice in converting the single-crop crawfish with rice forage to an estimate for single-crop crawfish with other planted forage.

Crawfish costs of production

Table 2 presents 2011 projected output and costs per acre for the three chosen crawfish production systems. Estimates are based upon 1) annual consultation with Extension and research personnel working with craw-

Table 2. Projected output and costs per acre for three crawfish production systems, 2011.

Item	Unit	Price	Single-crop crawfish with rice forage		Rice-crawfish double-crop		Crawfish-rice-fallow rotation	
Production outputs			**Quantity**	**Amount**	**Quantity**	**Amount**	**Quantity**	**Amount**
Crawfish	lbs		600		600		600	
Rice	cwt	13.00			42.00	546.00	60.00	780.00
Rice checkoff	cwt	0.08			-42.00	-3.36	-60.00	-4.80
Direct expenses								
Custom applications								
Airplane seeding	cwt	5.60	1.40	7.84	1.40	7.84	1.20	6.72
Global positioning system	acre	0.35	2.00	0.70	4.00	1.40	9.00	3.15
Airplane fertilization	cwt	6.25	0.75	4.68	4.40	27.50	3.80	23.75
Airplane pesticides	acre	5.50			1.00	5.50	5.00	27.50
Drying rice	cwt	0.90			47.19	42.47	68.00	61.20
Hauling rice	cwt	0.30			42.00	12.60	60.00	18.00
Bait								
Fish	lbs	0.44	175.00	77.00	131.25	57.75	90.00	39.60
Manufactured	lbs	0.21	180.00	37.80	90.00	18.90	120.00	25.20
Fertilizer								
Nitrogen	lbs	0.51			125.00	63.75	125.00	63.75
Phosphate	lbs	0.63			50.00	31.50	50.00	31.50
Potash	lbs	0.48			50.00	24.00	50.00	24.00
Urea (45%)	lbs	0.19	75.00	14.25				
Labor	hr	9.60	8.86	85.01	10.13	99.06	9.06	88.86
Chemicals*	$	1.00				15.36		80.28
Other								
Rice gate	ea	3.65			1.00	3.65	1.00	3.65
Seed crawfish	lbs	1.00			60.00	60.00	60.00	60.00
Hip boots or waders	pair	74.95	0.01	0.62	0.01	0.62	0.01	0.62
Sacks	ea	0.40	18.18	7.27	18.18	7.27	18.18	7.27
Rice seed	lbs	0.36	120.00	43.20	120.00	43.20	120.00	43.20
Diesel fuel	gal	2.75	73.97	203.41	120.57	331.55	114.69	315.39
Gasoline	gal	2.61	1.60	4.16	1.33	3.46	1.26	3.28
Repair and maintenance	$	1.00		17.66		29.96		32.89
Interest on operating capital	$	1.00		12.77		27.14		18.70
Total direct expenses	$	1.00		516.42		914.56		978.59
Total fixed expenses	$	1.00		165.46		167.07		175.29
Total specified expenses	$	1.00		681.89		1081.63		1153.89
Allocated cost items	$	1.00		120.00		120.00		120.00

*See Boucher and Gillespie (2011) for more detail on chemical usage, including herbicides, insecticides, and fungicides.

fish; 2) crawfish farmers; 3) a 2008 survey of Louisiana crawfish farmers, from which 75 responses were received; and 4) annual updates of input prices. Though inputs from crawfish farmers vary, these estimates are meant to be representative of the "typical" farming situation. The reader is cautioned that production costs and output vary from year to year, particularly as input prices and production conditions vary. Therefore, while these estimates can be used as a general guide, it is suggested that the interested reader consult the LSU AgCenter website for the latest annual production cost estimates that include a more detailed explanation. Alternatively, contact the authors of these reports. Figures in Table 2 assume pricing and production in Louisiana on a relatively large farm of 120 acres with six 20-acre ponds.

Examining the 2011 estimates leads to some insights. First, the double-crop and rotation systems produce output in addition to crawfish—we assume 42 cwt (hundredweight or 100 pounds) of rice per acre for the double-crop and 60 cwt of rice per acre for the rotation. However, these systems also require additional inputs, and thus higher costs. Custom services (custom applications) vary by system, with airplane rice seeding and fertilization being charged for all three systems. In addition, for the double-crop and rotation systems, airplane applications of pesticides, drying of rice, and hauling of rice are also included. Both fresh/frozen and manufactured bait are used, with the expense being lower in the double-crop and rotation systems because there are fewer traps (as found in a 2008 survey by the authors). Fertilizer expense is highest for the double-crop and rotation systems because only 75 pounds of 45% urea is used in the single-crop system versus 125, 50, and 50 pounds per acre of nitrogen, phosphate, and potash, respectively, in the double-crop and rotation systems.

"Other" expenses are higher for the double-crop and rotation systems, since a rice gate (the structure that allows water to flow from one field through a levee to the next field) is used and seed crawfish are needed annually. Diesel fuel expenses are higher for the double-crop and rotation systems primarily because more water is pumped into those systems and additional field operations such as harvesting are required for the rice crop. If an electric power unit were used for pumping rather than a diesel power unit, costs would generally be lower. Repair and maintenance also increase for the double-crop and rotational systems relative to the single-crop system.

Overall, the major direct expenses for single-crop crawfish production are bait, labor, and fuel. For the double-crop and rotation systems, custom applications, fertilizer, and fuel are the largest direct expenses. Of the two allocated cost items, general farm overhead and land opportunity cost, we do not make distinctions among the systems. We assume, for instance, that the farmer could lease the land to another farmer at $90 per acre.

Table 3 presents break-even selling prices for crawfish at an "average" base yield of 600 pounds and four other yields that are 10 percent and 20 percent higher and lower than the base. These figures assume 42 and 60 cwt of rice are produced in the rice-crawfish double-crop and rice-crawfish-fallow rotation systems, respectively, and sold at $13 per cwt. Yield is very important in covering expenses. In 2011, a crawfish price of $1.14 was required to cover total specified expenses at the base yield for single-crop crawfish with rice forage, while increasing or decreasing the yield by 20 percent changed the break-even selling price to $0.95 per pound or $1.42 per pound, respectively. Likewise, to cover variable costs, a crawfish price of $0.86 per pound was required at the base yield, while increasing or decreasing the yield by 20 percent changed the break-even selling price to $0.72 per pound or $1.08 per pound, respectively. According to *Louisiana Summary,* crawfish prices over the 1991–2010 period ranged from a low of $0.50 per pound in 1993 to a high of $1.75 in 2000, for a 20-year average of $0.84 per pound. Expenses climbed over the period 1991–2011, with total direct expenses for the single-crop crawfish with rice forage system increasing from $266.63 to $516.42, total fixed expenses increasing from $126.19 to $165.46, and total specified expenses increasing from $392.82 to $681.89 (McManus et al., 1991; Boucher and Gillespie, 2011). Production expenses continue to climb while the

Table 3. Break-even selling prices for crawfish for selected yield levels.

Crawfish production per acre	480 lbs	540 lbs	**600 lbs baseline**	660 lbs	720 lbs
Price required to cover total specified expenses					
Single-crop crawfish	1.42	1.26	**1.14**	1.03	0.95
Crawfish-rice double-crop	1.12	1.00	**0.90**	0.82	0.75
Crawfish-rice-fallow rotation	0.79	0.70	**0.63**	0.57	0.53
Price required to cover variable costs					
Single-crop crawfish	1.08	0.96	**0.86**	0.78	0.72
Crawfish-rice double-crop	0.77	0.69	**0.62**	0.56	0.52
Crawfish-rice-fallow rotation	0.42	0.38	**0.34**	0.31	0.28

crawfish price remains volatile. Changes and variability in expenses and returns are more thoroughly discussed by Gillespie et al. (2012).

Record keeping in crawfish production

Good record keeping is essential to maximizing profitability, though some farmers are reluctant to devote much time to this activity. Our 2008 survey of Louisiana crawfish farmers found that only 38 percent used a computer for farm record keeping, 51 percent prepared an income statement, 25 percent prepared a cash flow statement, 41 percent prepared a balance sheet, and 16 percent prepared a statement of owner's equity. Clearly, more thorough record keeping could help crawfish farmers identify the economic strengths and weaknesses of their operations.

Producers and farm managers must make a variety of tough management decisions throughout the year. Each of those decisions generally has a degree of associated uncertainty and risk. This is particularly true for crawfish production, which can experience much variability and seasonality in production levels and prices, both during the production year and from year to year. Making decisions that affect the financial performance of the operation without accurate and detailed records undoubtedly increases the financial risk. At a time when historically high input costs have softened profit margins, it is increasingly important for operations to become more efficient to ensure their long-term economic viability. The ability to build on strengths and to anticipate and eliminate potential weaknesses depends on being able to analyze and track production and financial information over time.

A good record-keeping system is relatively simple, has the appropriate level of detail, and provides information on essential components of the operation on a timely basis. At a minimum, the record-keeping system should be able to generate production, revenue, and cost information for the operation as a whole and, preferably, for the different production units that make up the operation. With this information, the producer can determine profitability, see trends in production levels and input costs, and have information necessary for income tax reporting and for securing financing.

Record-keeping systems can be as simple as handwritten information entered into a notebook or as complex as computer software that allows for more detailed farm records analysis. Many computer-based financial management software systems are available. Most can generate a complete set of financial records (cash statement, balance sheet or net worth statement, and income statement), and some provide a degree of financial ratio analysis. While each has its own strengths and weaknesses, all can track revenue and costs and help a producer determine the overall profitability of the operation. Most, however, are not uniquely designed for crawfish production, nor do they make it easy to track and monitor production levels for the operation.

To provide an additional record-keeping option, the LSU AgCenter has developed an Excel© spreadsheet for crawfish production record keeping. Unlike other software systems that are designed for the complete financial analysis of an operation, this system was designed with ease of use in mind, while being able to track production and cash flow. The system allows the user to track production and sales levels either by individual production unit or for the operation as a whole. In addition, it allows the producer to track major production expenses throughout the year, as well as out-of-season costs such as land preparation, forage production, land rent, and debt payments. The record-keeping system can be downloaded for free at the URL on page 6.

The system allows the user to identify up to ten different production units and five different buyers. Thus, it can track production, revenue, sales volumes, and costs by individual production unit and by individual buyer. Once the production units and buyers have been identified, the user simply enters production, sales, and cost information into the system as they occur throughout the production year. As this information is supplied, the system automatically summarizes and categorizes it. The system provides production, revenue, and cost information during each month of the production year, as well as a cash flow statement for the operation for the entire year. If production units have been identified by the user, the system also provides production and financial information by month and by production unit to give insight into the variability in these levels throughout a production year and among the production units.

While the system developed by the LSU AgCenter does not offer a complete set of financial statements as many other software systems do, it does have the ability to generate a cash flow statement, which is generally viewed as the most common and most important financial statement. And, it has the advantages of tracking production levels and being designed with the uniqueness of crawfish production in mind.

Summary

Crawfish production can yield long-run returns that exceed costs if the farm is well managed. The crawfish farmer should select a production system that best complements his or her existing operation, goals, and objectives. In some cases, for instance, double-cropping

or rotating crawfish with rice will be a reasonable option. Regardless of the production system chosen, budget and cash flow estimates for the crawfish operation should be developed for planning purposes so that the farmer can make informed economic decisions. Crawfish prices can be highly volatile, depending heavily upon production conditions by year and even within the year. Once the operation is up and running, it is important that the farmer keep good records for planning, tax, and financial purposes. There are a number of record-keeping systems that can help in farm decision making.

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For more information:

http://www.lsuagcenter.com/en/our_offices/departments/Ag_Economics_Agribusiness/extension_outreach/budgets/

Download the record-keeping system:

http://www.lsuagcenter.com/en/crops_livestock/aquaculture/crawfish/Economics+Markets++Marketing/Crawfish-Production-and-Marketing-Record-Keeping-System.htm

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