



Evaluating the Economic Impact of Crawfish Production on the Rice Enterprise in a Rice/Crawfish Crop Rotation System

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Introduction

Crawfish are produced on over 100,000 farmed acres annually in Louisiana. Most this production occurs in the southwestern part of the state. Crawfish can be produced in a monoculture or rotational production system.¹ Production of crawfish in a monoculture or “single-crop” system is a common practice for many small farms or where marginal land, unsuitable for production of other crops, is available. This type of production system utilizes permanent ponds or sites devoted to several consecutive years of crawfish production. Production of crawfish in a crop rotation system is more typical on larger farming operations.

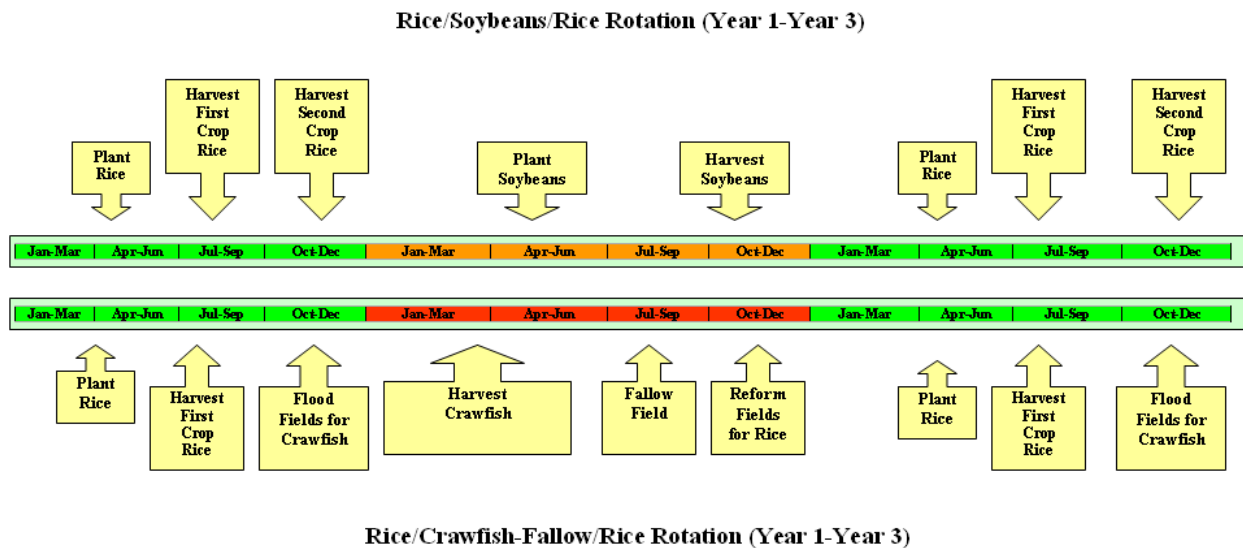
Several different rice and crawfish production rotation systems are commonly found in Louisiana. Variations in these production systems are related to the crop following crawfish in the second year of the rotation (rice, soybeans, fallow). In each of these crop rotation systems, crawfish culture follows a rice crop and the forage crop used

for growing crawfish is the rice crop residue and re-growth of the rice stubble following harvest. Advantages of these crop rotation systems include efficient use of land, labor and farm equipment.

Production of crawfish within a rice rotational production system presents a unique illustration of the economics and farm accounting aspects of crop rotation. Figure 1 presents a three-year timeline of typical operations in a rice rotation system with soybeans and crawfish as alternative rotational crops in year 2. In both cases, production of the rotational crop occurs in year 2 following the initial rice crop in year 1 and preceding the following rice crop in year 3.

Due to the nature and timeframe of its production cycle, crawfish production has a different impact on the economics of the rice enterprise in the rotation system compared with an alternative rotational crop such as soybeans. This report evaluates the economic impact of crawfish as a rotational crop on the rice enterprise, identifying cost

Figure 1. Three-year rotational timeline for field operations in rice production crop rotation systems with soybeans and crawfish as alternative rotational crops.



differences unique to crawfish production and presenting relevant economic principles in the assignment of production costs to alternative farm enterprises and its implication for crop rental arrangements.

Identification of Rice Enterprise Impacts

Optimum rice planting dates are recommended as March 15-April 20 for Southwest Louisiana.² Harvest of the rice main crop in this region of the state generally occurs in July or August. The rice field can then be reflooded for production of a ratoon, or second, crop with harvest in October. As shown in Figure 1, the production of soybeans as a rotational crop does not interfere with the rice production cycle in either year 1 or year 3. Production of soybeans in year 2 of the rotation does not preclude harvest of a rice ratoon crop in year 1 nor does it impose additional production costs on the rice crop in year 3. The same would be true if the rice field was fallowed in year 2.

However, production of crawfish as the rotational crop does have an impact on the rice enterprise. Three common impacts of a crawfish rotational crop on the rice enterprise have been identified in rice and crawfish crop rotation systems. One impact affects the preceding rice crop in year 1 and the other two impacts affect the following rice crop in year 3.

Harvest of crawfish produced in year 2 of the rotation would generally start in January. Rice fields therefore must be flooded for crawfish production in October of the preceding year. The flooding of the rice field in October of year 1 for crawfish production in the following year, therefore in many cases, precludes the ability to produce and harvest a ratoon crop of rice in year 1. In some instances, a ratoon rice crop may be harvested before reflooding the field for crawfish production. However, this ratoon crop harvest comes at the expense of the crawfish crop.

Crawfish are harvested by boats traveling across the field 3-5 days per week, every week, generally over a six-month period (Jan.-June). The impact of these harvest boats repeatedly traveling over the field in very shallow water causes ruts to be formed in the boat paths across the field. Following crawfish production, additional field tillage operations are generally required to smooth out these

boat ruts in advance of rice seedbed preparation and planting operations.

When a rice crop following crawfish is planted in year 3, that rice field has been in an aquatic state for as much as 18 months with no chemical weed control measures employed. As a result, aquatic weeds in the following rice crop are much more difficult to control than if rice was following a different rotation crop such as soybeans where herbicides could have been used to control weeds. (Crawfish production may also have an impact on the rice crop preceding it by limiting the herbicide and insecticide choices available for use on the rice crop which contains stocker crawfish).

Rice and the rotational crop, crawfish or soybeans for example, represent separate enterprises within the farming operation. Enterprise analysis is the economic analysis of the income and production expenses associated with a single enterprise.³ Proper enterprise analysis requires that the returns and costs associated with the production of a specific enterprise are assigned to that enterprise. Most enterprise returns and costs are relatively easy to estimate and assign to the appropriate crop enterprise. A rice and crawfish crop rotation, however, presents some unique, yet important, aspects of enterprise analysis and farm accounting.

The three impacts of the rotational crawfish crop production on the rice enterprise identified here, at first glance, all appear to be *associated with rice production*. Loss of first year rice ratoon crop, additional field tillage in the second year to prepare ground for rice planting and additional herbicide requirements to control weeds in the third year rice crop are all related to the rice enterprise. However, these additional costs (or foregone revenue) are *caused by the production of crawfish* as the rotational crop. In enterprise farm accounting, farm costs should be attributable to the responsible enterprise (commodity) in an appropriately allocated manner. Costs attributable to, or caused by, the production of crawfish on the rice enterprise should be correctly charged to the crawfish enterprise.

Estimation of Crawfish Impact Costs

In the example rice/crawfish crop rotation system illustrated here, production of crawfish in year 2, in many instances, precludes the production and harvest of a rice ratoon crop in year 1. Although

the inability to harvest a rice ratoon crop and receive revenue from the sale of that rice is not an actual, out-of-pocket, cash “expense” for the rice enterprise, it is an economic cost nonetheless.

The loss of potential net revenue from a rice ratoon crop production in year 1 is caused by the farm management production decision to produce crawfish in year 2. This potential net revenue loss is referred to, in economic terms, as an opportunity cost. This opportunity cost is caused by the decision to produce crawfish in year 2 and therefore should correctly be charged as a “cost” to the crawfish enterprise account.

The opportunity cost of the inability to produce a rice ratoon crop can be estimated as the net returns the rice producer would have received if the ratoon crop would have been produced. Producer net returns from a ratoon crop is affected by many factors including, ratoon crop yield, rice market price, ratoon crop production expenses, and rice rental arrangements.

As an example, assume that the potential ratoon crop yield is 18.0 cwt. (11.1 bbl.) per acre and the rice producer has a 70/30 share rental arrangement, with the landlord receiving 30% of the crop proceeds and paying the ratoon crop pumping cost. Using the projected seasonal average rough rice market price for the 2007/08 marketing year of \$12.00 per cwt. (\$19.44 per bbl.)⁴ and estimated producer variable ratoon crop production expenses of \$81.60 per acre⁵, the opportunity cost to the rice producer of not harvesting a rice ratoon crop in year 1 of the rotation can be estimated as follows:

$$\begin{aligned}
 &(\$12.00/\text{cwt} \times 18.0 \text{ cwt.} \times 70\%) - \$81.60 \\
 &= \$69.60 \text{ per acre opportunity cost} \\
 &(\text{net return above variables production costs})
 \end{aligned}$$

Smoothing boat ruts in the field following the crawfish crop generally requires additional field operations not needed when rice is following soybeans as the rotational crop. Costs for additional field operations estimated here includes two passes each over the field with a disk and a land level. Tillage costs are estimated for a 300 hp tractor pulling a 32 ft. disk and a 24 ft. land level.⁵ The performance rate (hours per acre) for the disk operations were increased by 50% (from 0.06 to 0.09 hours per acre per pass) to account for overlap of disk passes to smooth out ruts. Estimation of these additional tillage costs, caused by crawfish

production, would be the variable costs (fuel, labor and repairs) of performing these two operations.

Field Operation	Performance rate	Times over	Total variable cost
Disk	0.09	2.0	\$10.26
Land level	0.15	2.0	<u>14.50</u>
Additional tillage cost			\$24.76 per acre

The costs of additional herbicides on the rice crop in year 3 following crawfish can vary widely from field to field and are directly impacted by the variety of rice grown, specific weed pressure in the field and selection of herbicides used. Costs estimated here are presented as an example of the possible range in values of these additional rice herbicide costs can be.

Herbicide Program for Conventional Rice Variety:

Following soybeans		Following crawfish	
Facet	0.5 lbs.	Command	12.0 oz.
Londax	1.0 oz.	Clincher	15.0 oz.
2,4-D	<u>2.5 pts.</u>	Permit	<u>1.0 oz.</u>
Cost/acre	\$40.93	Cost/acre	\$52.59
Additional cost per acre		\$11.67	

Herbicide Program for Clearfield Rice Variety:

Following soybeans		Following crawfish	
Newpath	8.0 oz.	Newpath	12.0 oz.
Aim	1.6 oz.	Grasp	2.8 oz.
		Londax	<u>1.6 oz.</u>
Cost/acre	\$38.11	Cost/acre	\$90.18
Additional cost per acre		\$52.07	

In the conventional rice variety production example, a typical herbicide program for rice following soybeans might include Facet (0.5 lbs), Londax (1.0 oz.) and 2,4-D (2.5 pts.). However, to combat the greater aquatic weed pressure following crawfish, a typical rice herbicide program might include Command (12.0 oz.), Clincher (15.0 oz.) and Permit (1.0 oz.). The additional herbicide cost for this after-crawfish herbicide program is \$11.67 per acre in material cost.

For production of Clearfield rice, a typical herbicide program for rice following soybeans might include Newpath (8.0 oz.) and Aim (1.6 oz.). Following crawfish, a typical Clearfield rice herbicide program might include a higher rate of Newpath (12.0 oz.), plus an application of Grasp (2.8 oz.) and Londax (1.6 oz.). The additional herbicide cost for this after-crawfish herbicide program is \$52.07 per acre in material cost.

As stated above, this additional herbicide cost for rice following crawfish can vary greatly from field to field. The average of the two example cases presented here, \$31.87 per acre, provides an estimate of the likely level of increase in herbicide cost, in terms of magnitude, on the year 3 rice enterprise caused by crawfish production in year 2.

The summation of these estimated costs provides an estimate of the economic impact of crawfish as a rotational crop on the rice enterprise in a rice/crawfish crop rotation system. In the example presented here, production of crawfish had estimated costs of \$126.23 per acre which impacted the rice crops in years 1 and 3. These additional costs were the result of crawfish production as the rotational crop and should, correctly, be charged as expenses to the crawfish enterprise.

Additional Rice Production Expenses:

Ratoon crop net income loss in year 1	\$69.60
Additional tillage for boat ruts in year 2	\$24.76
Additional herbicide costs in year 3	<u>\$31.87</u>
Total estimated increase in rice expenses	\$126.23

Implications for Crop Rental Arrangements

The production of crawfish as a rotational crop within a rice production system has an economic impact on the rice enterprise in ways that other rotational crops do not. As a result, correctly charging production expenses or opportunity costs to the appropriate enterprise means that a rice and crawfish crop rotation has important implications for crop land rental arrangements.

In situations where the rice producer is the single and only tenant over the entire crop rotation cycle, the enterprise farm accounting is fairly straightforward. Additional production expenses (or opportunity costs) imposed on the rice enterprise, but caused by the crawfish operation, would be charged as expenses to the crawfish enterprise

account from a farm accounting perspective. Revenue from crawfish production would be credited to the crawfish enterprise account and would be available to offset additional costs impacting the rice enterprise. Cash or share land rent payments would be paid to the landlord as agreed to in the crop land rental arrangement.

In situations where the land in year 2 is being rented out by the landowner for crawfish production to a third party who is not the rice producer, that crawfish production results in economic costs being imposed on the rice producer for which no revenue is available to help offset those additional costs. These additional rice production expenses cannot, in reality, be charged to the crawfish enterprise because it is associated with a third party individual. In these situations, crop land rental arrangements between the landowner, the rice producer and the crawfish producer should reflect the fact that these additional costs are being imposed on the rice enterprise. This can be accomplished in a relatively fair manner by reducing the rent being paid by the rice producer (cash or share) to the landowner and adjusting upward the rent being paid from crawfish production to the landowner. In addition, the additional rice production expenses incurred in a rice/crawfish crop rotation could be shared between the rice producer and the landowner.

Summary

This report provides estimates of the relative economic impact of crawfish production on the rice enterprise in a rice/crawfish crop rotation system. Crawfish production in this rotation most commonly impacts the preceding year's rice ratoon crop, as well as tillage operations and herbicides programs for the following year's rice crop. The economic value of these impacts are not insignificant and should be fairly accounted for in crop land rental arrangements, particularly in cases where the crawfish are being produced by a third party.

References

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