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# Development of the interactive broiler income spreadsheet

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*Tara Shofner<sup>\*</sup> and H.L. Goodwin, Jr.<sup>§</sup>*

## **ABSTRACT**

The poultry industry has experienced unprecedented increased efficiencies since 1960 in large part due to vertical integration facilitated by production contracts between growers and integrators. As growers seek information about contract production they need to be well informed about all aspects of the process, especially potential income. Recent poultry grower complaints have surfaced as a result of incorrect expense and revenue expectations. The Interactive Broiler Income Spreadsheet (IBIS) is being developed to enable current and prospective poultry producers to better estimate income. IBIS, an unbiased Excel™ spreadsheet tool to assist in decision making regarding broiler production profitability, uses actual grower expense and revenue information or, alternatively, grower-panel default data to assess income under various grower-specified production, expense, and price scenarios. Poultry integrator grower service personnel, lenders, and Cooperative Extension professionals will utilize IBIS to assist growers in operational planning and risk tolerance identification in varying economic situations. Growers may also gauge effects of capital improvements, equipment upgrades, chick placements, and time between flocks on income. Development of IBIS is continuing with collection of additional data and revision of procedures based upon results of field testing.

\* Tara Shofner graduated in May 2001 with a degree in agricultural business.

§ H. L. Goodwin, Jr., faculty sponsor, is an associate professor in the Department of Agricultural Economics and Agribusiness.

## **INTRODUCTION**

The poultry industry has evolved from chickens roaming in the backyard to highly specialized operations that produce a total of 900 billion birds a year for meat. The poultry industry has experienced unprecedented success in production and marketing efficiencies. One of the reasons this success has been a direct result of the use of contracts between the grower and the integrator. Contracts have worked very well for a number of years; however, recently there have been many complaints from poultry growers (Banker, et al. 1997). Part of the problem is a result of poultry growers' incorrect expectations about projected expenses and revenues. There is no publicly available data to examine grower returns; therefore, it is nearly impossible to determine the overall financial situation of poultry growers (Rogers, 1992). For the most part, growers make their business decisions regarding the feasibility of new or expanded poultry farms based upon information provided by integrators or from an informal network of other poultry growers in their area.

As potential growers seek information about contract production, they need to be well informed about

all aspects of the process, especially the potential income. Poultry production is capital-intensive. The estimated investment for a fully equipped poultry farm in 1996 was \$100,800 for a 42 ft. x 500 ft. house, with most farms having at least two houses (Vukina, 1998). Even though poultry farmers invest 50% of the capital required for producing the final products for the industry, over 71% of contract growers earn a net income below the poverty level from their poultry operations (Krebs, 1999). A major risk that the grower faces is the capital cost of the land, and the degree of the asset fixity for the buildings and equipment, since they have no good alternative use (Rogers, 1990).

Many integrators give the growers only oral information about the profits that they will receive under the contract (G. Harral, personal communication). This may be because the integrator does not have complete information to give a potential grower. One major problem is that individual poultry operations may not generate the initial profits anticipated based upon information obtained from the integrator or the informal grower network. Even if profits are in line with projections initially, they may decline in subsequent years, making it necessary for the farmer to seek other

### **Meet the Student-Author**



***Tara Shofner***

I graduated in May 2001 with a degree in agricultural business, and I am now working on a master's degree in agricultural economics. Dr. H.L. Goodwin, my undergraduate faculty sponsor for the broiler production spreadsheet project, is now my academic advisor for my graduate studies.

I am a native of Elkins and a 1997 Elkins High School graduate. I am one of several UA graduates in my family with degrees in agriculture or home economics (now human environmental sciences). Other UA alumni include my father and his parents and an aunt and uncle. My brother, Travis, is a senior majoring in turfgrass management at the UA.

The opportunity to conduct research as an undergraduate student helped me decide to pursue graduate study. My research experience was one reason for my selection as the UA student representative at the Princeton Today International Conference in New York City. I also won two research presentation contests, one each sponsored by the American Agricultural Economics Association and the Arkansas chapter of Gamma Sigma Delta.

I was a summer 2001 intern with the Arkansas Farm Bureau Federation in Little Rock, which helped prepare me for my career goal of working in agricultural marketing.

income opportunities (H.L. Goodwin, unpublished data). In late 1999, the Arkansas Farm Bureau Federation (AFBF) asked the University of Arkansas to conduct a survey of 1300 of its members that were poultry growers (Goodwin, in press 2001). These growers were asked to rank their satisfaction with various aspects of the poultry business. Many acknowledged discontentment with the financial returns in their poultry operations. For example, of the 288 respondents, 56% of growers expressed some degree of dissatisfaction with the income that they receive from their poultry operations. Sixty-seven percent stated that they are not getting a fair return on their investment. Respondents also contended that they are unhappy about the communication between themselves and their integrator. Eighty-four percent of respondents agreed with the statement, "My company should provide educational programs to help producers better estimate income and expenses." In response to the statement "Communication between growers and companies is adequate," 53% of respondents disagreed. In the free response section, one grower stated, "There is not enough information for potential growers," and almost 45% of growers surveyed by the AFBF survey said there is not adequate problem-solving information available to them.

Many producers find it necessary to have off-farm income. Over 47% of respondents of the AFBF survey revealed that their spouse had either part-time or full-time off-farm employment. There simply may not be adequate net income from the average 3.4 house poultry operation to support a household. This is particularly the case if substantial debt service on the operation exists.

*Problem Statement.* There are several reasons why profitability from broiler operations is so difficult to forecast. First, it is still nearly impossible to effectively determine revenue for poultry growers because of the grower pay system used throughout the industry. The grower payment amount may not actually reflect the grower's performance compared to an average grower, but rather to the other growers who sell in the same weekly pool. The pool takes all the producers who sell in the week and ranks them by their cost of production (Doye, 1996). The middle grower receives the base pay amount only. If the growers' cost of production is lower than the middle, they receive the base pay plus a premium proportional to their ranking. If their costs are above the middle, they are penalized and receive a dis-

counted base pay. Therefore, the actual amount that the grower receives in base pay and bonuses depends on performance of other growers that sell in the same week.

Secondly, estimating income may be difficult because of varying poultry house size (Doye, et al., 1996). While most new poultry houses are built on a standard house size, many older houses were not built to any standard size. Variable dimensions of older houses can also lead to difficulty in estimating profitability. Many potential growers are faced with trying to estimate revenues and expenses from a standard estimate sheet provided by the integrators.

Finally, many potential poultry farm sellers are not usually willing to supply all of their past records to be evaluated before the sale of their farm. Potential growers may find it very difficult to get an accurate approximation of the farm's past performance. And, as alluded to previously, integrators do not have accurate records for growers possibly due to the lack of communication and because they view the growers as independent contractors for grower services.

Budgets play an important role in planning for any new investment. The two types of budgets of particular interest to poultry farmers are capital investment budgets and enterprise budgets. Budgets aid in the systematic evaluation of alternative plans by putting the plans "on paper" to determine which will maximize profits (Kay and Edwards, 1999). They can be helpful in planning, implementation, and control of any farm business.

Major capital purchases should be carefully analyzed and planned to make certain they fit into the long-term operation of the business. Given the large amount of capital that poultry farms must borrow, capital budgeting is one of the most important financial management tools available to producers (Beierlein et al., 1995). For many poultry producers, capital budgeting does not end after the initial investment of houses and equipment, but continues with the investment in company-required upgrades. As new technology is introduced, many poultry operations are obligated by their contracts to upgrade or replace existing equipment.

Enterprise budgets organize projected income, expenses, and profit of a single enterprise (Kay and Edwards, 1999). These budgets may be published by the Cooperative Extension Service or the poultry companies such as Tyson's, Perdue, or Gold Kist. Enterprise

budgets are very general and are a good starting place for prospective growers to begin their research into poultry farming. However, they may use assumptions that can skew projections of profitability. Most of these budgets do not break down the costs into enough detail. Growers are also concerned about the hidden expenses that are not explicitly described on these enterprise budgets or by the integrator (Cunningham, 1995). Each poultry operation is unique, and many of these budgets do not reflect different factors such as assorted house sizes, litter as an expense or revenue. They may also disregard the extreme discrepancy between utility expenses due to variable natural gas, propane and electricity rates and the use of wells versus municipally-treated water.

*Objectives.* The overall objective of this project was to help prospective and current poultry producers to better estimate profits by developing the Interactive Broiler Income Spreadsheet (IBIS). IBIS is an unbiased tool using Excel™ software that will be made available to existing and prospective growers to use as they make decisions regarding the current and potential profitability of raising chickens. Specifically, it will:

1. Allow growers to more precisely estimate revenues and expenses;
2. Allow growers to calculate the feasibility of new investments;
3. Allow growers to easily change any of the factors that will influence estimates of revenues and expenses to reflect current weather, price, interest, or regulatory conditions.

## **MATERIALS AND METHODS**

The first step in this project was to develop a data collection sheet. The information collected from this sheet was used as the default information. It was important to have default data, especially for potential growers who have no records of their own. This collection sheet was also used as a foundation for the spreadsheet. The data collection sheet gathered information about all areas of production expenses and revenues for each of 4 years. The data collection sheet was modified several times, as it became apparent that important information was excluded. One of the most important steps of this project was to accurately reflect all of the expenses that are incurred by poultry growers. Many of the expenses were broken down into usage amount and price per unit instead of simply total cost to be

more precise.

After the data collection sheet was developed, grower participation was needed. The data collection sheets collected information from contract growers from the four largest poultry integrators in northwest Arkansas. Those companies are George's, Peterson Farms, Simmon's Industries, and Tyson Foods. The companies approved the participation of at least four contract growers from their companies. These growers were selected from the top one-third of each production complex based on their past performance and record-keeping practices. All information collected was confidential and no names of the growers or integrators were requested on the data that was collected.

Data were collected through personal contact. Each of the four growers were mailed a data collection sheet with a cover letter explaining the purpose of the research. Each letter was followed up by a telephone call to answer questions. In addition, farm visits were made utilizing the same data collection sheets as previously mailed. This additional step proved to be most successful. Many of the growers were not easily reached by phone and felt too busy to sit down and answer numerous questions about their farm; however, all the growers were more than happy to answer questions during the visit. To date, information from eight growers has been obtained, verified, and analyzed, and four others have agreed to personal visits. In addition, all grower information will be averaged before this panel data will be used as default values for the various cost and income components of IBIS.

## **RESULTS AND DISCUSSION**

*Interactive Broiler Income Spreadsheet Development.* IBIS was developed using Excel™ software. A sample of IBIS is located in Table 1. The sample data presented was from one of the farms included in the data collection phase. The sensitivity of the program can not be adequately observed in the sample; however, the sample does provide a look at the inputs and outputs of the formulas. IBIS is divided into two parts: assumptions and budget analysis. The assumption section is divided into house dimensions, estimated income, estimated expenses, and loan information. The budget analysis section takes the information from the assumptions and computes profits.

The assumption section begins with the "House Dimensions" segment that totals the number of houses

and computes the total square footage of the poultry houses. Since most houses are built in a few standard sizes, the sizes 40 ft x 400 ft, 40 ft x 200 ft, 32 ft x 400 ft, and 42 ft x 500 ft are formatted so that the user only has to enter the number of each of those sized houses they operate. However, there are many poultry houses that do not fit into one of these four typical sizes. IBIS is designed so users may enter up to three unique house sizes along with the number of houses of that particular size. The total square footage is used in the default formulas to figure the net cash returns on a square foot basis. This allows users to compare returns on different size operations.

Next in the assumption section, users are asked to fill in cells with their information or utilizing the provided default numbers. After the user completes the "House Dimensions" section many of the default values automatically adjust based on the number of houses and total square footage of their operation. Many of the default values have formulas that allow for a more accurate value based on either the number of houses, number of chicks, or total square footage. Many current growers, however, will have their own records that more precisely reflect their operation.

The income section separates all areas of possible income-generating activities. Many poultry producers have other enterprises that supply income. Some of the farmers who participated in data collection had cattle, sheep, goats, and/or hay operations. IBIS, however, only includes the income that is directly derived from poultry operations. Default information is provided for almost every category except gas and utility allowances and the average bonus amounts. These three items vary tremendously by company, geographic location, and individual grower preferences. Use of any default amount could be very misleading; therefore, the individual integrator or producer can better estimate these values.

The expense section is divided into variable and fixed expenses. Usage amount and price per unit divide many of the variable expenses. The fixed expenses include taxes, insurance, depreciation, and opportunity costs. Many of the fixed expenses do not have default values because they are things such as initial investment amount on houses and equipment, interest rates on loans, and cost of land. These values will vary by user. Below the "Estimated Expenses" section is the "Loan Information" section. The section asks for basic loan information that will be used in the budget analy-

sis below. There are three areas for loan information: house loans, equipment loans, and upgrade loans. Many users may not utilize all three areas. Some may have a combined house and equipment loan. Also, current producers may only need to compute the payments on an upgrade if that is what they are considering.

Also included to the right of the assumption section are question and answer prompts. These help clarify the particular information being asked for and help to answer question that may arise from various growers in actual farm situations. In the IBIS example that is attached, only a select number of prompts are shown. For instance, several of the questions address the different uses of litter. Litter is included in both the revenue and expense sections. This is because litter can be of value to growers if spread on their own farms or if sold to another farmer to spread. If growers use the litter on their own farms it is a credit, and if sold, it is a cash revenue. However, litter can also be an expense if the grower must pay someone for clean-out and disposal. This would be the case if the grower either did not have the land area or the desire to spread the litter. Other prompt questions cover issues such as company utility allowances, dead bird disposal cost, and water supply.

The "Budget Analysis" section uses the information gathered in the "Assumptions" section and computes total operating revenue, total operating expenses, total fixed expenses, total expenses, net farm income, net farm income per square foot, net cash returns, and net cash returns per square foot. The budget analysis includes both budget value and cash value. The net cash income is computed by converting the revenue information entered into a pay formula of:

$$\text{Chicks per flock} \times \text{Flocks per year} \times (100 - \text{Percent mortality}) / 100 \times \text{Average pounds per finished bird} \times \text{Cents per pound (contract base)} / 100$$

The other poultry related, income-generating activities then add to the pay formula to get the total operating revenue. Those include litter revenue, gas allowances, utility allowances, and performance bonuses. Total operating expenses are then subtracted from total operating revenues to get net cash returns. Net cash returns per square foot are simply net cash returns divided by the total square footage computed in the assumption section. Net farm income is computed by taking the the total budget value expenses from the total operating revenues.

*IBIS Verification.* Continual verification of the effec-

tiveness and accuracy of the IBIS software is underway. Poultry integrators in northwest Arkansas were consulted about the feasibility of this project and were instrumental in collecting data for IBIS. Current poultry producers gave advice on the areas of revenues and expenses that should be incorporated, including many hidden expenses that were not in any of the published budgets. With the completion of the IBIS program, verification will continue to take place. A panel consisting of four lenders is being asked to compare IBIS results with their records. Also, trial runs are being conducted through field tests with current University of Arkansas poultry science students and with the guidance of Cooperative Extension Service specialists. After verification is complete, IBIS will be released to the public and monitored as the poultry industry changes to keep the program up-to-date and functional.

*Application of Results.* IBIS will be available to producers through the poultry integrators, area lenders, the Cooperative Extension offices, and a University of Arkansas website. IBIS will be primarily used by the poultry integrators as a decision-making tool for potential growers. By having this interactive software, they will be able to play “what if” games to identify their risk tolerance to varying income and expense levels. IBIS can be an effective training tool for service personnel and can be used to demonstrate to growers the income effects of management decisions. In addition, growers will have the capacity to gauge the effects of capital improvements/equipment upgrades and chicken placements per year.

As useful as IBIS can be, even the best farm management programs are of no use if producers do not have the skills, technology, or desire to use them. In the AFBF survey, while 60% of respondents used a computer in their farm operation, only 36% of those with a computer used a spreadsheet program. Many farmers do not see the need to implement computer technology in their daily operations. Even those who do use computers often do not have the knowledge to use this technology to their full advantage. It is also important to remember that even the best budget planning cannot take the place of good management. IBIS is simply a tool to help management be more effective.

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**Table 1. Interactive Broiler Income Spreadsheet**

(This example is for the first year only of broiler production in this operation)

**I. Assumptions Section**

**A. Initial Questions**

- 1. Do you have tunnel ventilation? If **YES** enter 1, if **NO** enter 0
- 2. Do you have cool cell? If **YES** enter 1, if **NO** enter 0
- 3. Do you have foggers? If **YES** enter 1, if **NO** enter 0

**B. House Dimensions**

Dimensions of houses:	40x400	<u>Enter house # here</u>	3	48000
	40x200		0	0
	32x400		0	0
	42x500		0	0
Enter other size houses HERE			0	0
Enter: =30*400, NOT 30x400			0	0
			0	0
	<b>Number of Houses</b>		<b>3</b>	
	<b>Total Square Footage</b>			<b>48000</b>

- After enter your house size information some of the default values will automatically adjust
- Please enter your own information if it is more accurate than the default values
- Some default values cannot be estimated and "none" appears in the cell
- If you have questions, please click on Questions??? for further clarification

**C. Estimated Revenues**

	<u>Default</u>	<u>Your farm</u>	
1. Chicks per flock	68570	60000	Questions???*
2. Flocks per year	5.5	5.5	Questions???
3. Percent mortality	4.5	4.4	Questions???
4. Ave lbs./finished birds	5.4	5.5	Questions???
5. Cents/lb. contract base	4.5	4.5	Questions???
6. Annual tons of litter	360	360	Questions???
7. Price per ton of litter	6	15	Questions???
8. Annual gas allowance	none	5112	Questions???
9. Annual utility allowance	none	0	Questions???
10. Annual average bonuses	none	5445	Questions???

**D. Estimated Expenses**

**Variable Expenses**

1. Annual trailer loads of bedding	3	3	Questions???
2. Price per trailer load of bedding	975	975	Questions???
3. Annual number of clean out loads	36	36	Questions???
4. Price per clean out load	30	30	Questions???
5. Annual number of cake out loads	30	30	Questions???
6. Price per cake out load	30	30	Questions???
7. Annual number of propane gallons	7398	7398	Questions???
8. Price per propane gallon	0.64	0.7	Questions???
9. Annual number cubic feet natural gas	6850	6850	Questions???
10. Price per foot natural gas	none		Questions???
11. Annual number of kilowatt hours	86400	86000	Questions???
12. Price per kilowatt hour	rates in Q/A	0.057	Questions???
13. Annual gallons of drinking water	743500	743500	Questions???
14. Annual gallons of water for other uses	0	7590	Questions???
15. Price per 1000 gallons of water	rates in Q/A	2.75	Questions???
16. Annual repair costs on facilities	none	500	Questions???
17. Annual cleaning supplies cost	none	500	Questions???
18. Annual pest control costs	none	1000	Questions???
19. Annual dead bird costs	none	2500	Questions???
20. Annual hours of paid labor	none	200	Questions???
21. Hourly wage, paid labor	6	6	Questions???
22. Annual paid labor for services	none	1500	Questions???
23. Annual misc. expenses	none	1200	Questions???

**Fixed Expenses**

1. Annual insurance cost	2925	1875	Questions???
2. Annual property taxes	none	3000	Questions???



3. Annual land charge	none	4000	Questions???
4. Initial house investment (exclude house equip.)	none	330000	Questions???
5. Salvage value on house	none	20000	Questions???
6. Years in house life	30	30	Questions???
7. Initial house equipment investment	none	60000	Questions???
8. Salvage value on equipment	none	5000	Questions???
9. Years in equipment life	15	15	Questions???

#### E. Loan Information

Note: If the loan is not applicable to your farm, enter 0 on the "Amount borrowed" line of that loan.

##### House Loan

1. Interest rate on house loan		0.09	Questions???
2. Number of years in loan		15	Questions???
3. Number of payments per year		4	Questions???
4. Amount borrowed on houses		300000	Questions???

##### Original Equipment Loan

5. Interest rate on equipment loan		0.09	Questions???
6. Number of years in loan		15	Questions???
7. Number of payments per year		4	Questions???
8. Amount borrowed on equipment		15000	Questions???

##### Upgrade Equipment Loan

9. Interest rate on upgrade loan		0.09	Questions???
10. Number of years in loan		10	Questions???
11. Number of payments per year		4	Questions???
12. Amount borrowed on upgrade		0	Questions???

#### II. Budget Analysis Section

	Budget value	Cash value
Poultry contract	78081	78081
Litter revenue	5400	5400
Allowances	5112	5112
Bonuses	5445	5445
<b>Total Operating Revenue</b>	<b>94038</b>	<b>94038</b>
Litter removal	4905	4905
Utilities	12146	12146
Repairs	7590	7590
Maintenance	4500	4500
Labor cost	2700	2700
Misc. expenses	1200	1200
<b>Total Operating Expenses</b>	<b>33041</b>	<b>33041</b>
Insurance	1875	1875
Property taxes	3000	3000
Annual land charge	4000	0
Depreciation	14000	0
House payment	27154	27154
Equip. payment	1358	1358
Upgrade payment	0	0
<b>Total Fixed Expenses</b>	<b>51387</b>	<b>33387</b>
<b>Total Expenses</b>	<b>84428</b>	<b>66428</b>
<b>Net Farm Income</b>	<b>9610</b>	
<b>Net Farm Income Per Sq. Ft.</b>	<b>0.200</b>	
<b>Net Cash Returns</b>	<b>27610</b>	
<b>Net Cash Returns Per Sq. Ft.</b>	<b>0.575</b>	

#### \* Hot Button Prompts for "Questions???" Regarding Poultry Litter

Q-What if I don't have a total clean out each year?

A-Allow 12 ton per decade.

Q-What if someone cleans out my houses for only the litter?

A-Enter 0.

Q-What if someone cleans out my houses and pays me?

A-Enter 0.

Q-What if someone cleans out my houses and spreads the litter on my farm?

A-Enter 0.

Q-What if someone cleans out my houses and pays me?

A-Enter 0, that income will be credited above.