

An Investment Analysis Of A Southern Mixed Enterprise Farm: Broilers and Silvopasture

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Abstract

This investment analysis evaluates a 320-acre mixed enterprise farm involved in producing broilers, hay, and pine trees over a 30-year planning horizon. A net present value analysis was conducted to determine the feasibility of this investment. A sensitivity analysis was also performed to identify and measure the impact of sensitive parameters in the investment analysis.

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Introduction

When planning to diversify a farming operation, a farmer should be careful to select enterprises that complement each other. In the Southern U.S., broilers and beef/forage, or broilers and hay, complement each other very well. The broiler litter from the broiler operation can be used as fertilizer on the pasture or hay land, which reduces fertilizer costs of the forage enterprise, thus increasing farm profitability, and at the same time ridding the broiler enterprise of a waste product at little cost.

The growth of these mixed enterprise farms involving broilers and pasture has spread throughout the Southern U.S. However, along with the wide adoption of these mixed enterprise farms is an increasing environmental concern about an oversupply of the waste byproduct (broiler litter).

The primary purpose of this study was to determine the financial feasibility of investing in a mixed enterprise farming operation located in South Alabama on bare cropland over a 30-year planning horizon. This hypothetical farm operation consisted of broilers and silvopasture (a mixed planting of haygrass and pine trees which produces hay and timber). The farm site must be located in the vicinity of a broiler integrator and must grow hay and timber well. This study examines several financial measurements that provide investors with a measure to compare this investment with a given financial objective, as well as with other investments. This study will also provide insight about the effect of waste management restrictions on broiler operations. These waste management restrictions both limits the production potential of an intensive livestock operation (1 broiler house per two acres versus 1 broiler house per 30 acres) and encourages the adoption of complementary enterprises.

Study Procedure

This study evaluates the initial capital costs, revenues, and production costs associated with the production of broilers and silvopasture from previously bare cropland. These estimates were projected over a 30-year planning period and were used to develop annual estimates of after-tax cash flow. Net present value and internal rate of return procedures were used to determine the financial feasibility of the mixed enterprise farming operation using annual estimates of after-tax cash flow

with tax benefits and after-tax cash flow without tax benefits (after-tax profit less principal payment). The net present value provides a measure of the net value of the investment in today's dollars, while the internal rate of return provides the farmer with a measure to compare this investment with other investments.

A series of Microsoft Excel® spreadsheets were used to develop the necessary financial data tables to evaluate this investment decision. These tables consisted of capital investment requirements, operating budgets for the different enterprises, loan amortization schedules, depreciation schedules, a projected capital and operating budget spread over thirty years, net present value, and internal rate of return. These tables provide the basis for determining the financial feasibility of this mixed enterprise farm investment.

Capital Requirements

Capital expenditures for establishing a mixed enterprise farming operation tend to be quite large. Some of the expenditures for this operation include: land, broiler houses and equipment, hay establishment, timber establishment, machinery and equipment, water wells, and improvements. The initial capital investment budget for this operation can be viewed in more detail in Table 1.

The total capital costs for this diversified farming operation located in South Alabama on 320 acres of previously bare cropland sums to \$1,556,663. It was assumed that 75 percent, or \$1,167,498, of this investment would be financed, and the remaining \$389,166 would be supplied by the investor. The reason for such a large initial investment for this operation is mainly due to the number of broiler houses. The broiler enterprise provides consistent cash flow and the largest contribution to net farm income on many Southern farms. Unfortunately, the waste (broiler litter) generated from broiler production is becoming a constraining factor of production for broiler producers. Due to the growth in the number of broiler houses, broiler producers are confronted with an oversupply of the waste byproduct. Increasingly, integrators and lenders are encouraging broiler producers to own enough land that safe application of the waste can be made without adversely affecting the environment. In this study, the number of broiler houses was limited to six houses. The waste from the six broiler

houses could be safely applied to the 203 acres of hay land and not adversely affect the environment. The total capital cost of this diversified farm investment (\$1,556,663) is significantly larger than the average value of an Alabama farm.

Table 2 describes the total cost, cost per productive acre, and cost per gross acre for the mixed enterprise farm. The cost per productive acre and cost per gross acre were \$6,081 and \$4,865, respectively. The cost of the broiler houses and land accounted for 85 percent of the total cost.

Production Projections

The broiler operation consisted of six broiler houses located on 12 acres of land, which are under a production contract with a broiler integrator. The income generated from the broiler operation consisted solely of the payment the producer receives from the integrator for growing the birds, which on this operation is \$0.0525 per pound (sometimes referred to as the broiler settlement price). The gross income of the broiler operation in the first year of operation was \$233,242 and the total operating expenses were \$78,787. The operating expenses of the broiler enterprise included energy, labor, dead bird disposal, house and equipment upgrades, which must be made every three years, property tax, and insurance. Actual broiler farm data from the Alabama Farm Business Analysis Association were used in this study (Brown, et al.). The gross income and operating expenses were increased annually at two and two and one-half percent, respectively, over the 30-year planning period to account for inflation, etc.

The hay operation consisted of 203 acres of Tifton 9 bahiagrass located between double rows of pine trees (40 feet between the two rows of pine trees spaced at 6 x 8 feet). Tifton 9 bahiagrass was used because of its shade tolerance, high yield, and improved nutritional qualities. Initially, the hay operation would produce five tons of hay per acre per year under ideal conditions, but this value would decrease over time due to a shading effect by the pine trees. The initial market price for hay was determined to be \$54.26 per ton by using the previous five-year average hay price received by Alabama farmers (Alabama Agricultural Statistics Service). The initial operating cost was determined to be \$47.63 per acre (Prevatt, 2002). Since the hay operation is using broiler litter from the broiler operation as fertilizer, the operating cost was considerably less

than the value used for a typical bahiagrass operating budget which uses commercial fertilizer. The only cost associated with fertilizing the hay land was the spreading cost. The hay market price and operating cost were both assumed to increase over time due to inflation. The inflation factors used were a 2 percent increase in revenues, and a 2.5 percent increase in operating costs.

The timber operation consisted of 41 acres of Loblolly pine. The Loblolly Pine was selected because it is easy to establish, well suited to the soils of Southeast Alabama, and will mature faster than the Longleaf Pine. The sources of revenue for the timber include two cuttings of pulpwood, two cuttings of chip-n-saw, and three cuttings of saw timber. The two cuttings of pulpwood occur in years ten and fifteen. The two cuttings of chip-n-saw occur in years fifteen and twenty, and the three cuttings of saw timber, which are the most valuable, occur in years twenty, twenty-five, and thirty. The operating cost includes pruning the trees in years six and eight and clean up after each harvest. It was determined that the pruning of the trees should be custom hired due to the quantity of the trees, and the time it would take to prune them.

This mixed enterprise farm also included 64 acres of residual or unusable land. This land consisted of ditches, streams, buffer zones around ditches, and roads. These buffer zones were needed to decrease the amount of run-off of surface water and nutrients applied to the hay land. These buffer zones are required by the Natural Resource Conservation Service to decrease the likelihood that some of the broiler litter applied to the hay land may find its way into the ditches and streams (National Resource Conservation Service).

It was determined that this mixed enterprise farming operation would require more labor than the average farm because of its size and diverse enterprises. It was decided that a manager and two seasonal laborers would be needed to meet the labor demands of this operation. The manager's starting salary was \$25,000 per year, and the two part-time laborers starting salaries were \$5,000 each per year. These values were increased over time due to increased cost of living and inflation at three percent annually.

Investment Analysis Methodology

The projected capital budget, operating budget, tax benefit, and cash flow budget summarizes the timing and allocation of capital expenditures, revenues, operating expenses, interest expenses, overhead, salaries, profits, after-tax profits, tax benefits, and the resulting after-tax cash flows, as shown in Table 3. The after-tax cash flow with tax benefits represents the sum of after-tax profit and tax benefits less the principal payments, while the after-tax cash flow without tax benefits represents after-tax profit less principal payments. The annual estimates of the after-tax cash flows were used to determine the net present value and the internal rate of return for this mixed enterprise farming operation.

Net present value is a commonly used measure to determine financial feasibility. Net present value provides a measurement of the net value of a multiyear investment in today's dollars (Erickson). The net present value utilizes the initial investment, the annual cash flows from the investment, the salvage or terminal value, and a discount rate to determine the feasibility of the investment. The discount rate consists of three components, which are a risk-free interest rate, an inflation premium, and risk premium. The 30-year average for 90-day treasury bills was used to capture the risk-free interest rate and the inflation premium. This rate was determined to be 6.15 percent. The risk premium for the agricultural investment was assumed to be two percent. Thus, the discount rate used in this study was 8.15 percent.

Internal rate of return is one of the most widely used measures of return on investment projects. The cash flows in the internal rate of return method include the initial investment, annual cash flows from the operation during the 30-year planning period, and the salvage value of the machinery, equipment, and land at the end of the 30-year period. The internal rate of return provides the investor with a measure that may be used to compare alternative investments.

A net present value and internal rate of return were computed for two scenarios: An individual who can utilize the tax benefits (after-tax cash flow with tax benefits) and an individual who can not utilize the tax benefits (after-tax cash flow without tax benefits or after-tax profit less principal payment). The same initial investment (\$389,166) and salvage value (\$776,531)

were used in each computation. The salvage value estimate included the sale of the land and the sale of broiler house machinery and farm machinery and equipment. The land asset was assumed to appreciate at an annual rate of 1.5 percent over the 30-year investment period. The gain realized on the sale of the land was adjusted at a capital gains tax rate of 20 percent. The sale values of the broiler house machinery and farm machinery and equipment were assumed to be at their respective salvage values.

Results

The traditional net present value and internal rate of return estimates were computed for this investment, as reported in Table 4. The first column, labeled after-tax cash flow with tax benefits, describes the scenario of an individual who can utilize the tax benefits of this investment. The net present value analysis utilized the \$389,166 initial investment, annual estimates of after-tax cash flow with tax benefits, a salvage value of \$776,531 at the end of the 30-year period, and a discount rate of 8.15 percent. The net present value based on the after-tax cash flow with tax benefits was \$12,719. The net present value associated with the after-tax cash flow with tax benefits of this investment was greater than zero; thus this investment would be considered an acceptable investment based on the 8.15 percent discount rate.

The internal rate of return analysis used the \$389,166 initial investment, annual estimates of after-tax cash flow with tax benefits, and a salvage value of \$776,531 at the end of the 30-year period. The internal rate of return based on the data in this study using the annual estimates of the after-tax cash flow with tax benefits was 8.39 percent and may be used to compare this investment with other alternative investments.

In addition, the net present value and internal rate of return were computed for an individual that could not utilize the tax benefits. The second column, labeled after-tax cash flow without tax benefits (after-tax profit less principal payment), describes the scenario of an individual who can not utilize the tax benefits of this investment. This net present value investment analysis utilized the \$386,166 initial investment, annual estimates of after-tax cash flow without tax benefits, a salvage value of \$776,531 at the end of the 30-year period, and a discount rate of 8.15 percent. The net present value was

\$102,092. The net present value associated with the after-tax cash flow without tax benefits was less than zero; thus this investment would be considered unacceptable based on the 8.15 percent discount rate.

The internal rate of return analysis for the individual that could not use the tax benefits used the \$389,166 initial investment, annual estimates of after-tax cash flow without tax benefits (after-tax profit less principal payments), and a salvage value of \$776,531 at the end of the 30-year period. The internal rate of return based on the data in this study using the annual estimates of after-tax cash flow without tax benefits was 6.32 percent.

A sensitivity analysis was also conducted to determine the effect that a unit change in an individual parameter would have on the entire model, as shown in Table 5. The individual parameters used in the sensitivity analysis were interest rate, hay price, hay yield, land price, broiler settlement price, flocks per year, weight per bird, pulpwood price, chip-n-saw price, and saw timber price. The parameters that had the greatest effect on the net present value were interest rate, broiler settlement price, weight per bird, and flocks per year. Common incremental unit changes observed in the industry were used in the sensitivity analysis. An increase in the broiler settlement price by \$0.0035 increased the net present value by \$118,223. An increase of 0.5 flocks produced per year increased the net present value by \$136,128, and an increase of 0.25 pounds per bird produced increased the net present value by \$106,334. Of course, a decrease in these parameters would result in a decrease of the same magnitude.

Conclusions

With the current conditions in agriculture of low returns, increasing production costs, and the requirement of a substantial initial investment, an investor wishing to invest in production agriculture has a difficult decision to make. The mixed enterprise farm in this study had returns greater than most agricultural investments, and the net present value financial measure indicated this investment would be an acceptable investment provided the tax benefits could be fully utilized. In addition, the financial returns (internal rate of return) on this investment exceeded the returns of the stock market, certificates of deposit, and United States Treasury bills, when averaged over thirty years. However, this long-term investment analysis "does not" include a risk analysis of the sensitive parameters.

The sensitivity analysis identified several parameters that could make this investment unacceptable. An increase in interest rates, decrease in broiler settlement price, decrease in flocks per year, and decrease in weight per bird were the most sensitive parameters that could adversely affect the decision to invest in this mixed enterprise farm. Another major concern associated with this investment is future environmental regulations. The future application level of phosphorous that will be allowed for soil is presently unknown and could adversely affect the feasibility of this operation given the relatively high levels of phosphorus in the broiler litter. In addition, the number of broiler integrators in the local area and length of commitment are concerns that merit examination.

While this investment analysis approach is not new, it does address an interesting situation associated with complementary enterprises, particularly given the increasing restrictions surrounding waste management for intensive livestock operations. Thus, this study addresses more than the financial feasibility of a Southern mixed enterprise farm producing broilers and silvopasture, but more specifically suggests an alternative to make an intensive livestock operation viable by adopting complementary enterprises. Therefore, this study may have research implications for other intensive livestock operations (dairy, hogs, etc.).

Given the uncertainties involved with production agriculture, individuals who wish to invest in a mixed enterprise farm operation should become familiar with production practices, market prices, labor requirements, complementarities of enterprises, sensitive parameters, environmental concerns, and business commitment and infrastructure before deciding if the level of risk is acceptable. With the information provided in this study and some understanding of the risk involved, an individual can make a more informed decision about investing in this mixed enterprise farm of broilers and silvopasture.

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Table 1. Itemized initial capital investment budget for a mixed enterprise farm, Southeast Alabama, 2003

Item	Itemized	Subtotals
Land		
Year Operation to begin	2003	
Total price of land	\$480,000	
No. of acres purchased	320	
No. of acres - broiler operation	12	
No. of acres - hay operation	203	
No. of acres - pine operation	41	
No. of acres - residual acres	64	
Sub-total		\$480,000
Development - Hay Establishment		
Hay Establishment - Custom Hired	\$31,125	
Subtotal		\$31,125
Development - Loblolly Pine Establishment		
Loblolly Pine Establishment - Custom Hired	\$7,239	
Subtotal		\$7,239
Development - Broiler Houses		
Class-A Tunnel Ventilation	\$364,500	
House Equipment	\$445,500	
Composter	\$18,000	
Generator	\$18,000	
Subtotal		\$846,000
Irrigation/Water		
Well costs	\$4,200	
Pump costs	\$2,000	
Pipe and materials costs	\$1,000	
Other costs	\$0	
Subtotal		\$7,200
Improvements -		
Storage Barn - Machinery & Equip.	\$7,500	
Storage Barn - litter	\$17,500	
Storage Barn - Hay	\$24,000	
Fencing, Perimeter	\$7,920	
Subtotal		\$56,920
Machinery & Equipment		
Pick-up truck	\$30,000	
Tractor w/ loader	\$15,000	
Mower-cond.	\$9,000	
Windrower	\$2,000	
Tedder	\$3,000	
Bale wagon	\$500	
Truck (2-ton)	\$7,000	
Baler Round, 1200-1500lb	\$17,310	
Grader blade	\$1,179	
Cruster	\$9,947	
Mower-rotary	\$1,744	
Tractor	\$13,000	
Misc. (chainsaws, power tools, etc.)	\$8,500	
Spreader truck	\$10,000	
Subtotal		\$128,180
Total Initial Capital Investment		\$1,556,663

Table 2. Capital budget for a mixed enterprise farm, 320 total acres, Southeast Alabama, 2003

Item	Total Cost	Cost per Productive Acre	Cost per Gross Acre
Land	\$480,000	\$1,875	\$1,500
Development Broiler Houses	\$846,000	\$3,305	\$2,644
Machinery & Equipment	\$128,180	\$501	\$401
Irrigation/Water	\$7,200	\$28	\$23
Improvements	\$56,920	\$222	\$178
Development Forage Establishment	\$31,125	\$122	\$97
Development Loblolly Pine Establishment	\$7,239	\$28	\$23
Total Capital Costs	\$1,556,663	\$6,081	\$4,865

Table 4. Net Present Value and Internal Rate of Return of a Mixed Enterprise Farm Investment, 2003

Year	After-Tax Cash Flow With Tax Benefits	After-Tax Cash Flow Without Tax Benefits
Initial Investment	(\$389,166)	(\$389,166)
1	\$40,941	\$29,468
2	\$38,667	\$27,918
3	(\$5,221)	(\$15,970)
4	\$40,225	\$29,476
5	\$35,634	\$22,658
6	(\$19,490)	(\$30,239)
7	\$35,695	\$24,947
8	\$41,999	\$29,023
9	(\$3,173)	(\$11,688)
10	\$34,247	\$23,969
11	\$22,391	\$8,741
12	(\$31,095)	(\$42,402)
13	\$20,509	\$6,859
14	\$12,530	(\$1,121)
15	(\$12,501)	(\$23,808)
16	\$75,777	\$62,127
17	\$95,452	\$81,802
18	\$41,381	\$30,074
19	\$87,156	\$76,877
20	\$101,926	\$91,648
21	\$1,465	(\$10,541)
22	\$67,217	\$55,212
23	\$59,695	\$45,202
24	(\$12,075)	(\$24,080)
25	\$106,822	\$92,329
26	\$26,308	\$22,093
27	(\$8,131)	(\$11,623)
28	\$51,563	\$47,348
29	\$47,231	\$43,017
30	\$187,933	\$187,933
Salvage value	\$776,531	\$776,531
Net Present Value ¹	\$12,719	(\$102,092)
Internal Rate of Return	8.39%	6.32%

Table 5. Sensitivity Analysis of Net Present Value

Item	Base Unit	Unit Change	Net Present Value of After-Tax Cash Flow With Tax Benefits	Change In Net Present Value
Net Present Value	\$12,719			
Interest Rate	0.0725	+ 1 point	(\$39,747)	(\$52,466)
Hay Price	\$54.26/ton	+ \$1/ton	\$21,978	\$9,259
Hay Yield	5 ton/acre	+ 0.5 ton	\$61,660	\$48,941
Land Price	\$1500/acre	+ \$100/acre	(\$7,536)	(\$20,255)
Broiler Settlement Price	\$0.525/lb	+ \$0.0035/lb	\$130,942	\$118,223
Flocks Per Year	6.5 flocks	+ 0.5 flocks	\$148,847	\$136,128
Weight Per Bird	4.25 lb	+ 0.25 lb	\$119,053	\$106,334
Pulpwood Price	\$15/cd	+ \$1/cd	\$12,862	\$143
Chip n Saw Price	\$80/cd	+ \$1/cd	\$12,850	\$131
Saw Timber Price	\$350/MBF	+ \$1/MBF	\$12,793	\$74