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ANALYSIS OF FARM BUDGETS OF TWO COMMERCIAL BROILER BREDER FARMS

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ABSTRACT

Data of nineteen complete broiler breeder production cycles were collected from Misr Arab and El-Rabie commercial farms over the period 1993-2000. Cycles started in two different seasons, winter and summer. Five strains were used, namely Arbor Acres, Avian, Hubbard, Isa, and Lohman.

The mean net profit per cycle was LE 1909204. Feed cost represented 42% of the total cost of inputs. Sold broilers contributed 90% of the total revenues.

Application of the stepwise regression procedure to predict net profit (Y) from budget variables showed that Y could be predicted with accuracy (R^2) of 0.72 from a one-variable model which only included the price of sold chicks. R^2 increased to 0.84, 0.92, and 0.95 when the price of purchased parent chicks, miscellaneous cost, price of sold broilers, litter cost and administration expenses were entered into the model. The complete determination of Y (R^2=1.00) was reached when 15 variables out of the studied 21 budget items were included in the model.

Keywords: Broiler breeder, budget analysis, stepwise regression.

INTRODUCTION

Poultry industry in Egypt has started some 40 years ago. The commercial poultry industry comprises four different systems of poultry production: broiler, layer, parent-stock, and grand-parent stock. The industry includes also slaughterhouses and hatcheries. Broiler breeder (Broiler parent stock) production is relatively new. Management of the broiler breeder has become a specialized task, and to our knowledge there is no previous attempt to highlight the different factors influencing this system of production.

Broiler breeder farms are rather few and use closed housing as well as open housing systems. Feeding, watering and heating are automatic. Usually, these farms which belong to large private companies have their own hatcheries. Day-old chicks are sold or raised in broiler farms owned by the same companies(Abdel-Aziz *et al.*, 2007).

The broiler breeder system contains 1) raising chicks produced by grand-parent farms to the age of egg production, 2) keeping laying chickens for a complete egg production cycle to produce fertilized eggs, and 3) producing hatching eggs to produce the final product of this system which is the day-old commercial broiler chick.

This work aimed at the analysis of budget data as a tool for system evaluation. Data on 19 complete broiler breeder production cycles were collected on five strains raised at two large commercial farms over the period 1993-2000. Cycles started in two different seasons, winter and summer.

MATERIALS AND METHODS

The collected data were recorded over a period of eight years (1993-2000, inclusive) from two commercial farms: Misr Arab Poultry Company (MA), and El-Rabie Poultry Company (ER). The farms are located at El-Sadat City and Regwa Region, respectively. Both farms are at about 120 km. North-west of Cairo off Cairo-Alexandria Desert Road.

Data comprised information on technical and financial performance of 19 complete broiler breeder production cycles .The data included technical information on both phases as well as detailed cost and revenue items.

Five strains were used: Arbor-Acres (A), Avian (V), Hubbard (H), Isa (I), and Lohman (L). The production cycles were executed in eight years (1993-2000), and started in two different seasons: Sept. – Feb. (W) and March – August (S).

The life cycle of parent stock consists of two phases, rearing (growing) and laying (production). The main purpose of the rearing phase is to achieve the target body weight and uniformity of each broiler breeder strain. The recorded data separated the rearing phase from the laying phase.

Financial data were analyzed with the commercial poultry industry in mind. Therefore, net profit(Y), defined as the difference between gross value of outputs and total cost of inputs, was identified as the criterion that represents the overall efficiency of the system. This criterion is, in fact, a function of all other budget variables. Independent variables included 16 cost variables and five revenue variables.

The problem of deciding which of a large set of independent variables to include in a model is a common one. A systematic approach to building a model with a large number of independent variables is to use a screening procedure available in most statistical software packages, known as the stepwise regression. The result of the stepwise procedure is a model containing only those terms which have significant effects at a specific level of probability

The software program (SAS, 1990) was used to fit all possible models starting with the one-variable model until the complete determination of the net profit (Y) , judged by the values of R^2, was reached.

Correlation coefficients among all independent variables were calculated in order to be sure of the independence of the X_i's .

The dependent variable (Y) was assumed to be a function of the budget independent variables, X_i's (i=1, 2,....,21) which are defined in table (1).

Table 1: Independent budget variables which affect the net profit per cycle(Y).

Variable Xi	Definition of cost or revenue items
Cost items:	
x_1	Price of purchased parent chicks.
x_2	Feed.
x_3	Feed additives.
x_4	Drugs and vaccines.
x_5	Litter.
x_6	Labour.
x_7	Fuel.
x_8	Maintenance and repair.
x_9	Tools and equipment.
x_{10}	Depreciation.
x_{11}	Miscellaneous.
x_{12}	Farm management.
x_{13}	Service management.
x_{14}	Incubation.
x_{15}	Marketing management.
x_{16}	Administration.
Revenues:	
x_{17}	Sold broilers.
x_{18}	Sold unhatchable eggs.
x_{19}	Sold chickens.
x_{20}	Manure.
x_{21}	Other products

RESULTS AND DISCUSSION

One important poultry system is the broiler breeder production system which provides commercial broiler farms with day-old chicks.

A poultry production system provides an ideal case for applying systems approach to research. The first phase of the systems approach is to describe as fully as possible the characteristics of the studied production system. This has been discussed by Abdel-aziz *et al.*(2007).

The efficiency of the broiler breeder production system depends on realizing targeted technical coefficients like low mortality, high hatchability, rapid growth, in addition to controlling fixed and variable costs of inputs and operations, and maximizing revenues from prices of the sold end products and by-products.

Data on production cost and revenues are scarce. Available financial data should be analyzed, evaluated, and interpreted for understanding the financial efficiency of the system. Budgeting is a primary tool which can be used for system evaluation and decision making.

Financial Characteristics:

Table 2 includes a listing of estimates of the main items of expanses and income of the studied broiler breeder system which can be used to determine the system's profitability. Net profit per cycle (Y), defined as the difference between total income and total cost, was identified as the main criterion that represents the overall efficiency of the system. The table contains a list of 16 cost variables and five revenue variables.

Table 2: Financial characteristics of the studied broiler breeder system (based on 19 production cycles) in Egyptian Pounds (L.E).

Variable	Character [1]	Mean	S.D	Minimum	Maximum
Y	Net profit	1909204	582980	862457	3183584
x_1	Price of purchased parent chicks	377447	31403	305610	448571
x_2	Feed	1729319	123780	1502511	1982838
x_3	Feed additives	155781	67956	44207	254780
x_4	Medicines and vaccines	184537	55769	120469	320707
x_5	Litter	62452	16738	32917	88458
x_6	Labour	157658	48754	120182	284245
x_7	Fuel	13197	8504	1744	28103
x_8	Maintenance and repair	77030	46790	8169	204290
x_9	Tools and equipment	40478	13595	31587	92994
x_{10}	Depreciation	161894	26999	94736	215081
x_{11}	Miscellaneous	27819	30529	6062	127690
x_{12}	Farm management	117982	21448	62888	150924
x_{13}	Service management	306456	68051	221225	508110
x_{14}	Incubation	207440	63249	111987	302008
x_{15}	Marketing management	217463	130866	34795	508248
x_{16}	Administration	340960	162513	174714	745854
X_{17}	Sold broilers	5441553	618436	4261750	7019680
X_{18}	Sold unhatchable eggs	47964	12420	35020	80318
X_{19}	Sold chickens	415068	47386	329560	511116
X_{20}	Manure	56762	14342	37730	83158
X_{21}	Other products	49241	9983	29445	64041

(1) Per cycle

Variables ($X_1, X_2, \ldots, X_9$) are variable costs defined as costs which vary directly with the amount of outputs produced, and variables ($X_{10}, X_{11}, \ldots, X_{16}$) are fixed costs which remain constant whatever the level of output. Variables ($X_{17}, X_{18}, \ldots, X_{21}$) represent revenues calculated from the quantity of each output times its price. Outputs include main products as well as by-products.

Graphic presentation of table 2 is given in figure 1 and figure 2. Figure 1 presents the share of cost items in the total cost of the broiler breeder cycle. Cost of feed represents 42% of the total cost. The same value was estimated by Lesson and Summers (2000) for cost of breed production. The second important cost variable is purchased parent chicks which represents only 9% of the total cost. Fixed cost variables ($X_{10}, X_{11}, \ldots, X_{16}$)which represent different management expenses such as, administration, and depreciation have, in general, higher shares in total cost than variable cost items ($X_1, X_2, \ldots, X_9$). Figure 2 shows that the contribution of sold chicks to the total revenues per cycle(X17) is 90%. Price of sold chickens after secession of their laying season represents 7% of the total revenues. The balance was contributed by by-products (X18,..., X21).

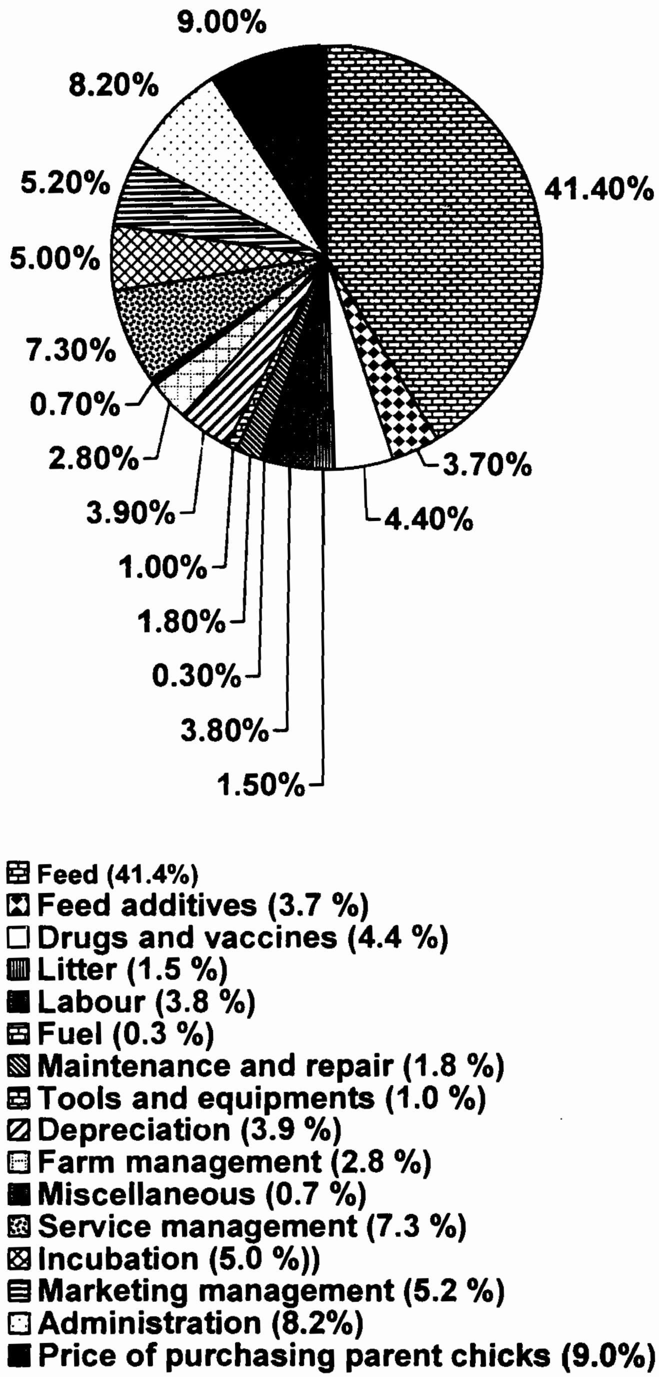

Figure (1): Share of cost items in he total cost of the broiler breeder cycle.

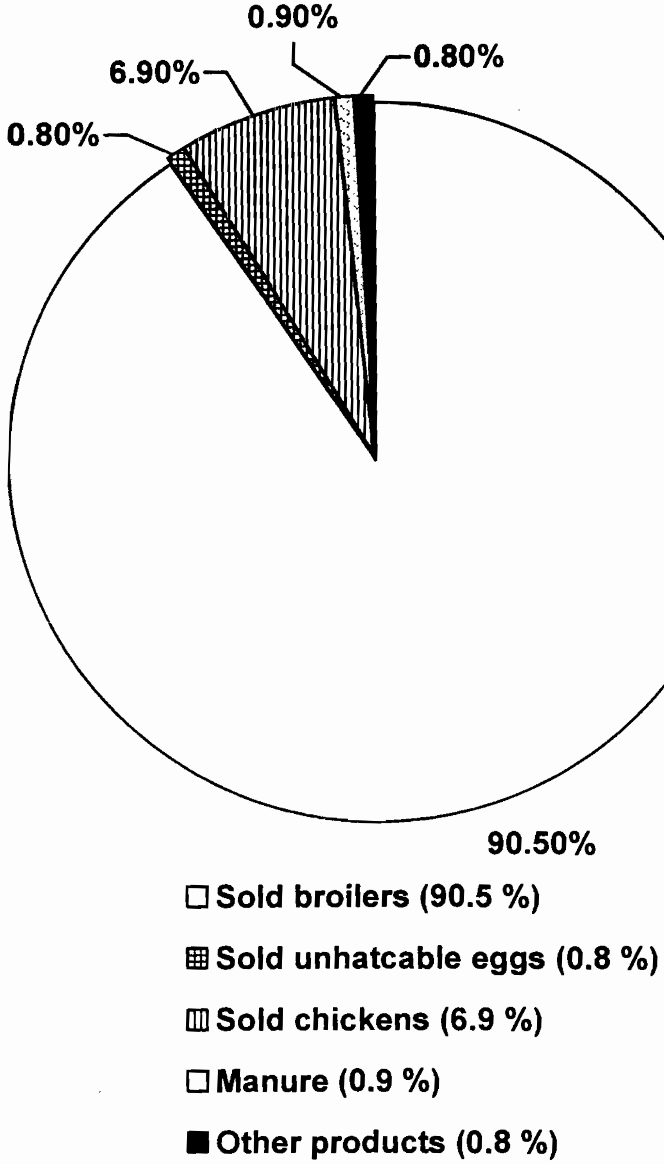

Figure (2) : Share of revenue items in the total revenues of the broiler breeder cycle.

Model Building Using Stepwise Regression:

Budget estimates are used to predict quantitatively the change in net profit per cycle (Y) for a unit change in cost and revenue variables. Multiple regression analysis provides one of the most useful tools for finding solution of such problems.

The problem under consideration is predicting (Y) for broiler breeder system from a few numbers of independent variables. The difficulty in building a model to describe Y is choosing only the important independent variables, out of many(21 variables in this study), to be included in the model. A systematic approach to solving this problem is a screening procedure known as stepwise regression (McClave and Sincich, 2000).

The available software program (SAS, 1990) starts step 1 by fitting all possible one-variable models. The independent variable, X_i, that produces the largest absolute t-value is declared the best one-variable prediction of the net profit per cycle, Y. Step 2 involves searching among the remaining independent variables, and the variable having the largest t-value is retained. The best two-variable model then is built, and so on.

The final result of the stepwise procedure is a model containing only those variables with t-values that are significant at the specified probability level. The produced model is of the form given in equation (3) of the material and methods. The accuracy of prediction for each model is given as R^2 value. Note that the F statistic is used in SAS as $F=t^2$ rather than the t-statistic in the stepwise procedure.

In order to be sure that the independent variables, X_i's, are not correlated, simple correlation coefficients among all variables were calculated. The complete SAS correlation matrix printout showed that only a few scattered coefficients were found significant at $P<0.05$.

Table 3 contains a list of the independent variables determining the net profit per cycle (Y), as entered in the 19 steps of the stepwise regression procedure.

Table 3: Independent variables (X_i's) determining the net profit per cycle (Y).

Step	Independent variables (X_i's) entered[1]
1	Price of sold chicks (X_{17})
2	Cost of purchased parent chicks (X_1)
3	Miscellaneous expenses (X_{11})
4	Price of sold chickens (X_{19})
5	Administration cost (X_{16})
6	Litter cost (X_5)
7	Service management cost (X_{13})
8	Labour (X_6)
9	Miscellaneous cost (X_{11}) replaced by price of sold manure (X_{20})
10	Drugs and vaccine cost (X_4)
11	Depreciation cost (X_{10})
12	Miscellaneous cost returned (X_{11})
13	Fuel cost
14	Miscellaneous cost (X_{11}) replaced by incubation cost (X_{14})
15	Price of other sold products (X_{21})
16	Fuel cost (X_7) replaced by cost of tools and equipment (X_9)
17	Cost of feed additives (X_3)
18	Incubation cost (X_{14}) replaced by cost of maintenance and repair (X_8)
19	Feed cost (X_2)

(1) X_i's are defined in table 1.

Table 4 contains five selected prediction equations showing the gradual improvement in R^2. The first variable entered in the model is X_{17} (the price of sold chicks). At the second step, X_1 (the price of purchased parent chick) was entered to the model. At the fourth step, X_{11} (miscellaneous cost) and X_{19} (price of sold chicken) is brought into the model. Step 6 involves building a six-variable model by entering X_5 (Litter cost) and X_{16} (administration expenses). R^2 values of the steps were 0.72, 0.84, 0.92, and 0.95, respectively.

The final step was step 19, where 15 variables out of 21 independent variables were entered to the model to reach $R^2 = 1.00$. In other words the variability in Y was completely determined by the 15 variables included in the model.

Values of X_i means were fitted to the six above mentioned models to check the accuracy of predicting Y. Comparing the predicted value with the mean value calculated directly from the actual data (LE 1909175 vs. LE 1909205) shows how close the estimates are. In the later steps of the stepwise regression procedure, the predicted estimates and the mean values get closer and R^2 improves. In the final step , the two values became identical and $R^2 = 1$.

It is worth mentioning that the results of the stepwise regression may be susceptible to making Type I or Type II errors in a number of the conducted t-tests. This means, from the practical point of view, that not all of the independent variables which are important for predicting Y have been identified or that all the unimportant independent variables have been eliminated. Also, the model used does not include higher order regression or interaction terms since it may extremely increase the number of dependent variables and, thus, complicate the computations.

Table 4: Prediction equations of net profit per cycle (Y) from estimates of cost and revenue items.

Step	Equations[(1)]		R^2
	Intercept	Independent variables entered	
1	$-2450 * 10^3$	$+ 0.8011 * X_{17}$	0.72
2	$-761 * 10^3$	$- 8.9967 * X_1 + 1.1148 * X_{17}$	0.85
4	$-1485 * 10^3$	$- 10.0441 * X_1 + 5.1582 * X_{11} + 1.1850 * X_{17} + 1.4269 * X_{19}$	0.92
6	$-1962 * 10^3$	$- 6.9293 * X_1 - 6.2656 * X_5 + 5.5627 * X_{11} - 0.6378 * X_{16} + 1.0873 * X_{17} + 2.4674 * X_{19}$	0.95
19	$1740 * 10^3$	$- 30.3798 * X_1 + 0.3222 * X_2 + 4.3927 * X_3 + 4.6787 * X_4 - 12.8425 * X_5 + 25.3227 * X_6 + 4.8425 * X_8 + 10.4456 * X_9 + 7.5314 * X_{10} + 22.8745 * X_{13} - 9.1606 * X_{16} + 1.0854 * X_{17} - 9.2614 * X_{19} + 41.7122 * X_{20} + 15.1555 * X_{21}$	1.00

(1) The X_i's are defined in table 1.

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تحليل الميزانيه المزرعيه لمزرعتين تجاريتين لانتاج أمهات التسمين

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جمعت هذه البيانات من ١٩ دورة تسمين من مزرعتي مصر العربيه والربيع للدواجن خلال الفتره (١٩٩٣- ٢٠٠٠). وبدأت هذه الدورات في موسمين مختلفين (صيفا وشتاء). وقد استخدمت خمس سلالات هي: (اربوراكيرز- ايفيان- هبارد- ايزا- لوهمان) .

صافي الربح بلغ للدورة الواحده ١٩٠٩٢٠٤جنيه وشكلت تكاليف التغذيه حوالى ٤٢ % من إجمالى تكاليف المدخلات, كما بلغ ثمن الكتاكيت المباعه حوالي ٩٠ % من إجمالي عائد الدوره.

أسفر التنبؤ بالربح الصافي للدروة (Y)عن طريق التحليل المتدرج (step wise regression) . أنه يمكن التنبؤ بقيمة (Y) ، بدرجة دقه (R^2 = 0,72)من النموذج الذي يحتوي فقط على سعر دجاج التسمين المباع .

تزداد درجة الدقه من ٠,٨٤ % إلى ٠,٩٢ % و ٠,٩٥ % عندما أدخلت أسعار الأمهات والمصاريف الثانويه وأسعار دجاج التسمين المباع وسعر الفرشة والمصاريف الإدارية في النموذج.

تم التوصل إلى التحديد الكامل لقيمة (R^2 =100) عندما تضمن النموذج ١٥ متغيرا من ٢١ شملتها الدراسه.