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OPTIMIZATION OF ECONOMIC RETURN OF FATTENING HERDS OF BALADI BULLOCKS IN RELATION TO AVERAGE DAILY GAIN AND MARKETING BODY WEIGHT

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ABSTRACT

This work aims at studying the enterprise of Baladi fattening farms in Egypt under the system of controlled feeding as affected by average daily gain (ADG). Different scenarios are discussed to maximize the return of fattening farms of Baladi. Seven normally distributed herds with different ADG (g) are simulated. All herds have initial body weight (IBW) of 230 kg and marketing body weight (MBW) of 400 kg. Based on the results of previous experiment, two scenarios are tested to maximize the return of fattening Baladi farms enterprise, the first is the MBW and the second is early culling rate. Prices of the inputs are calculated based on the price list of year 2010 in Egyptian bounds (LE). Output /input ratio, net return (%), annual return of investment (ROI, %), gross margin (GM) , number of fattening cycles/ year and cost of producing one kg gain, are calculated as economic indicators.

Economic indicators measured on the seven simulated herds show increasing output /input ratio (from 0.91 to 1.16), net profit per cycle (from -8.63 to 15.67 %) and ROI (from – 10.25 to 38.77%). With increasing ADG from 550 to 1150 g, this accompanied by decreasing cost of producing 1 kg gain by 52.4%. Herds having ADG less than 750g show negative values of output / input ratio, net profit per fattening cycle, ROI. This is because of the break -even point is between ADG of 650 and 750 g. However, comparing ROI of the simulated herds with annual bank interest (7%) indicate the break-even point is achieved when ADG is not less than 810 g. ROI shows reverse trend with increasing MBW from 400 to 550 kg, regardless the ADG. ROI value increased with increasing culling rate (from 5 to 20%), however, ROI reaches a value of more than 7% (the bank interest) under culling rate of 15% (9.3%).

In conclusion, ADG of less than 850 g is not profitable if compared with annual bank interest rate. MBW of 400 kg and early culling rate of 15% at least are two scenarios to maximize the ROI of Baladi fattening enterprise. Increasing ADG by 100 g at herd level increases net profit per cycle by 5.22 % and decreases cost of producing one kg gain by 3.6%.

Keywords: Baladi cattle, fattening, ADG, marketing weight, economic indicators.

INTRODUCTION

Under Egyptian conditions, red meat production of bovines is executed under different scales and systems (Tolba, 2000). It depends mainly on fattening of growing Baladi or buffalo male calves up to the marketing weight (El-Asheeri, 2008). Throughout the last decade, red meat production was faced by many threats resulting in cost of inputs and outputs of this industry. This in turn might lead to a reduction in total capitals invested in this sector, forecasting more increase in red meat price, unless an economical formula that satisfies producers could be reached.

Baladi calves show wide variation in their average daily gain (ADG, from 671 to 1228 g, Omar *et al.*, 1993; Sadek *et al.*, 1993; El-Bedawy *et*

al.,2004; Alsheikh *et al.*, 2004; and El-Asheeri, 2008), which affects farm profitability (El-Asheeri *et al.*, 2008 and Kopeček *et al.*, 2009), in addition to fattening period (Sahin *et al.*, 2009) and marketing weight (El-Asheeri *et al.*, 2008 and Mello *et al.*, 2009). However, ADG is considered as the main indicator of efficiency of fattening farms (Kopeček *et al.*, 2009).

Break – even point is used as a good indicator for farm profitability (Aksoy *et al.*, 2008). Break – even point is defined the minimum sale price needed to recover cash costs in a given year (Sprott, 1998).

In Egypt, few studies were conducted to calculate some economic indicators of fattening farms of Baladi bullocks (Tolba, 2000; Alsheikh *et al.*, 2004 and El-Asheeri, 2008), however, no comprehensive studies are available to determine economic indicators of Baladi fattening enterprises in relation to ADG, and what are the possible scenarios to be applied to maximize profitability.

Simulation is a mathematical model helpful in evaluating alternatives where very little real data are available (Dijkhuizen *et al.*, 1995), thus it designed to represent system and is useful in research that requires large group of animals (Shalloo *et al.*, 2004; Tedeschi & Fox, 2006 and Bewley, 2010).

The present study is planned to study the effect of ADG on the profitability of fattening Baladi herds, to explore scenario(s) that may increase benefits from Baladi fattening enterprise using simulation technique. Results of this study would also assist herdsmen in decision making via suggesting prediction equations.

MATERIALS AND METHODS

This study is conducted at Faculty of Agriculture, Cairo University, and comprised the following three stages, to estimate the economic indicators of fattening herds of Egyptian Baladi calves.

Simulated herds and experimental design:

The aim of this stage is to study the effect of average daily gain (ADG) on economic return of fattening Baladi herds. Seven herds with a size of 500 head each with different ADG are simulated using XLSTAT-Sim procedure. ADG is proposed to be 550 (H1), 650 (H2), 750 (H3), 850 (H4), 950 (H5), 1050 (H6) and 1150 (H7) g for the seven simulated herds. Averages of initial body weight (IBW) as well as marketing weight (MW) are supposed to be fixed in all herds being 230 and 400 kg, respectively. Initial body weight and ADG are normally distributed according to the assigned values ± 3 σ. (Table A). Feeding is proposed to be consists of concentrate feed mixture (CFM, dry matter 92%, crude protein 15%, ether extract 4.4%, crude fiber 9.2%, NFE 62.1% and ash 9.3%) and rice straw (RS) based on NRC (1996) requirements.

Based on the results of previous stage (Table 2), herds of ADG of 850 g (gained the minimum ROI) and 1150 g (gained the maximum ROI) were used to study the effect of MW on the herd profitability. Four marketing weights of 400, 450, 500 and 550 kg are simulated to calculate the economic

return within each of the above mentioned herds, as a scenario to determine what the best MW for Baladi cattle to maximize ROI should be.

Based on the results of the two previous steps, herd of 750 g ADG (H3 Table A) is used to study the effect of culling rate on the profitability of Baladi fattening enterprise. Four scenarios of culling rate (5, 10, 15 and 20%) were tested to determine the best scenario(s) that achieve higher ROI compared to the determined bank interest rate.

Table (A): Characteristics of initial body weight (IBW) and average daily gain (ADG) (LSM ± SE) of the seven simulated herds (H) of Baladi male calves (n=500 / herd)

Herd	IBW (Kg)			ADG (g)		
	Min.	Max.	Overall Mean	Min.	Max.	Overall Mean
H1	223.2	237.4	230.7±0.3	521.3	577.8	549.4±1.3
H2	222.8	238.1	230.2±0.9	611.6	684.8	649.7±1.4
H3	220.5	236.2	229.6±0.3	711.4	776.5	747.2±1.4
H4	223.6	238.1	229.8±0.3	811.8	894.1	849.0±1.5
H5	224.5	234.7	229.7±0.3	893.5	985.9	949.6±1.6
H6	223.1	236.2	230.0±0.3	1021.1	1091.5	1051.6±1.4
H7	223.1	240.9	230.2±0.3	1108.7	1188.5	1148.1±1.6

H1, H2, H3, H4, H5, H6 and H7 denote the seven simulated herds

Economic Indicators

Gross margin, output /input ratio, net return per cycle (%), number of fattening cycles/ year and cost of producing kg gain, and ROI were calculated as economic indicators. The herd was considered achieving profit when the net return exceeds 7%, which equals the annual bank interest.

Technical Coefficients:

The technical coefficients were calculated in Egyptian pounds (LE) based on the price list of inputs and outputs of year 2010.

- Labor = 1 person / 50 head
- Produced manure (m^3) = 20 / animal / year
- Feeding requirements = 2% of BW for CFM and 1% for RS

Price list:

- Purchasing price of one live kg BW of Baladi calves = LE 27
- Marketing price of one kg BW fattened Baladi calves = LE 24
- Concentrate feed mixture (CFM) / ton (LE) = LE 2100
- Rice straw / ton = LE 150
- Veterinary care = LE 75 / animal / year
- Casual labor = LE 30 / day / person
- Miscellanies = LE 20 / animal / 180 day
- Price of 1 m^3 manure = LE 20
- Farm rent = LE 18000/year (1500/month)

Calculations

- Consumed RS/ animal (ton) = (Average of offered RS × 0.01 of BW × Fattening period) / 1000

- Consumed CFM/ animal (ton) = (Average BW within fattening period × 0.02 of BW × Fattening period) / 1000
- Veterinary care = LE 75 × (fattening period /365)
- Casual labor = number of required labors × (LE 30/no of animals) × fattening period
- Miscellanies = LE 20 / 180 day
- Cost of consumed RS (LE) = consumed RS / animal (ton) × LE 150 per fattening period
- Cost of consumed CFM (LE) = consumed CFM / animal (ton) × LE 2100 per fattening period
- Purchasing price (LE) = IBW (kg) × LE 27
- Marketing price (LE) = MW (kg) × LE 24
- Produced manure (m^3) = 20 m^3 × (fattening period /365)
- Total cost (LE) = sum of (purchasing. price, feeding cost, labor cost, vet care and miscellanies)
- Variable cost (LE) = total cost - purchasing price
- Gross margin (LE) = total output – total cost
- Output / input ratio = total output / total cost
- Net return (%) = (gross margin / total cost) × 100
- Expected fattening cycle / year = 365 / FP
- Internal rate of revenue (%) = net return per cycle × number of expected fattening cycles
- Cost of producing kg gain (LE) = variable cost / total gain

Statistical Analysis

Data were analyzed using the General Linear Models procedure of SAS (2004). The following traits were analyzed : inputs (LE) including purchasing price (LE), cost of feeding (LE), labor cost (LE), veterinary care (LE), miscellanies (LE), farm rent (LE) and total cost (LE); outputs (LE) including selling price (LE), manure price (LE) and total income (LE) ; economic indicators including gross margin (LE), output /input ratio, net profit per cycle (%), return of investment (%) and cost of producing 1 kg gain (LE); fattening cycle characteristics including fattening period per cycle (day) and number of fattening cycles / year.

The model used was as follows:

$Y_{ij} = \mu + h_i + e_{ij}$

Where:

Y_{ij} = Observation on traits indicated above for individual;

μ = Overall mean

h_i = The fixed effect of i_{th} average daily gain (i=1 to 7) ,where 1=550 g, 2=650g, 3=750g, 4=850g, 5=950g, 6=1050g and 7=1150 g

e_{ij} = the error term assumed $(0, \sigma_e^2)$

Results of economic indicators were analyzed according to the following model:

$Y_{ijk} = \mu + a_i + h_j + (ah)_{ij} + e_{ijk}$

Where:

Y_{ijk} = Observation on traits indicated above for individual;
μ = Overall mean common to all observations;
a_i = The fixed effect of i_{th} average daily gain (i=1 and 2) ,were 1= 850g and 2=1150 g
h_j = The fixed effect of j_{th} Marketing weight (j=1 to 4), where 1= 400 kg, 2=450 kg, 3=500 kg and 4=550 kg
$(ah)_{ij}$ = interaction between the i_{th} ADG and the j_{th} MW
e_{ijk} = the error term assumed $(0, \sigma_e^2)$

The regression procedure in SAS (2004) was used to suggest prediction equations of some economic indicators of fattening Baladi herd based on ADG.

RESULTS AND DISCUSSION

Effect of average daily gain (ADG) on fattening herd profitability:

The present results revealed that running cost (feeding, labor, veterinary care, miscellanies and farm rent) decreased (P< 0.0001) with increasing ADG. Cost of feeding represented the major component of the running cost under Egyptian circumstances of fattening Baladi calves (90.5%) (Table1).

Table (1): Inputs and outputs (LSM ± SE) of Baladi fattening herds as affected by average daily gain (ADG) in reference to marketing weight of 400 kg(n=500 head/ herd)

Traits	Herds *							± SE	Pr > F
	H1	H2	H3	H4	H5	H6	H7		
Inputs (LE)									
Purchasing price (LE)	6210	6210	6210	6210	6210	6210	6210	6.05	1.000
Cost of feeding (LE)	4229^a	3576^b	3099^c	2733^d	2444^e	2211^f	2018^g	3.48	< 0.0001
Labor cost (LE)	185^a	156^b	136^c	120^d	107^e	97^f	88^g	1.93	< 0.0001
Veterinary care (LE)	64^a	54^b	47^c	41^d	37^e	33^f	30^g	0.07	< 0.0001
Miscellanies (LE)	34^a	29^b	25^c	22^d	20^e	18^f	16^g	0.36	< 0.0001
Farm rent (LE)	160^a	135^b	119^c	105^d	93^e	89^f	77^g	0.21	< 0.0001
Total cost (LE)	10881 a	10162	9635 c	9230 d	8911 e	8658 f	8440 g	3.66	< 0.0001
Outputs (LE)									
Selling Price (LE)	9600	9600	9600	9600	9600	9600	9600	0.001	1.000
Manure price (LE)	338 a	286 b	248 c	218 d	196 e	177 f	161 g	0.35	< 0.0001
Total income (LE)	9938 a	9886 b	9848 c	9818 d	9795 e	9777 f	9761 g	0.35	< 0.0001

* ADG of H1, H2, H3, H4, H5, H6 and H7 was 550, 650, 750, 850, 950, 1050, and 1150 g, respectively

Different superscripts between values within the same row differed significantly differed at (P < 0.05)

Increasing ADG of fattening Baladi calves from 550 to 1150 was associated with exponential increase in gross margin, output / input ratio, net profit per cycle (%) and ROI (%), meanwhile decreasing in cost of producing 1 kg gain by 55.4% (Table 2). It was obviously clear that gross margin, output / input ratio and net profit per cycle had negative values in herds with ADG of < 650 g (H1 and H2), where cost of producing 1 kg gain was higher than

selling price of 1 kg live body weight by about 14.6 and 2.9%, for both herds respectively. Hence, economic traits started to show positive trends with ADG of ≥750 g (H3) (Figure 1). However, herds of ADG of 750 g had ROI % less than the expected return of the bank (7 % per year), and this value started to display comparable values in herds of ADG of at least 850g at least (Table 2 and Figure 2).

Table (2): Economic indicators (LSM ± SE) of Baladi fattening herds as affected by average daily gain (ADG) in reference to marketing weight of 400 kg (n=500 head/ herd)

Traits	Herds *							± SE	Pr > F
	H1	H2	H3	H4	H5	H6	H7		
Total cost (LE)	10881 a	10162 b	9635 c	9230 d	8911 e	8658 f	8440 g	3.66	< 0.0001
Total income (LE)	9938 a	9886 b	9848 c	9818 d	9795 e	9777 f	9761 g	0.35	< 0.0001
Economic indicators									
Gross margin(LE)	-943 a	-275 b	212 c	587 d	885 e	1118 f	1321 g	3.81	< 0.0001
Output /input ratio	0.91 a	0.97 b	1.02 c	1.06 d	1.10 e	1.13 f	1.16 g	0.0001	< 0.0001
Net profit /cycle (%)	- 8.66 a	- 2.71 b	2.21c	6.36d	9.94e	12.93f	15.67g	0.04	< 0.0001
Return of investment (%)	-10.25 a	-3.80 b	3.54 c	11.62 d	20.30e	29.20 f	38.77 g	0.07	< 0.0001
Cost of Producing kg gain (LE)	27.5a	23.3b	20.2c	17.8d	15.9e	14.4f	13.1g	0.01	< 0.0001
Fattening cycles characteristics									
Fattening period per cycle (day)	309 a	261 b	226 c	199 d	178 e	161 f	147 g	0.32	< 0.0001
Number of fattening cycles / year	1.18 a	1.40 b	1.62 c	1.83 d	2.05 e	2.26 f	2.48 g	0.003	< 0.0001

*ADG of H1, H2, H3, H4, H5, H6 and h7 was 550, 650, 750, 850, 950, 1050, and 1150 g, respectively

Effect of marketing weight on the herd profitability

Increasing marketing weight (from 400 kg to 550 kg), resulted in increasing ($P<0.001$) of total cost in herds with ADG of 850 and 1150 g by 42 and 34%, respectively (Table 3). This is accompanied also by increasing the cost of producing 1 kg gain by about 22 and 23% for the two studied herds, respectively (Table 4).

Economic analysis of fattening cycle level indicated that marketing body weight between 450 and 500 kg recorded the highest input/output ratio and net profit per cycle in the two studied herds compared to the other marketing weight (400 and 550 kg), (Tables 3 and 4), however marketing weight of 400 kg recorded the highest ROI (%) compared to the other studied marketing weight.

It is interested to note that net return per cycle decreased by 2.7 % in H1 with ADG of 850 g, when marketing weight increased from 400 kg to 550 kg, while it increased by 1.1 % in H2 with ADG of 1150 g as calculated from the results indicated in Table (4).

Table (3): Inputs and outputs (LE, LSM ± SE) of Baladi fattening herds with interaction between average daily gain of 850& 1150g and marketing weight (MBW) of 400 -550 kg (n=500 head/ herd)

Traits	MBW (kg) of 850 g/day (H1)				MBW (kg) of 1150 g/day (H2)				±SE	Pr > F
	400	450	500	550	400	450	500	550		
Inputs (LE)										
Purchasing price	6210 ^{a}	6210 ^{a}	6210 ^{a}	6210 ^{a}	6210 ^{a}	6210 ^{a}	6210 ^{a}	6210 ^{a}	6.04	0.9999
Cost of feeding	2733 ^{e}	3820 ^{b}	5036 ^{c}	6378 ^{d}	2018 ^{e}	2822 ^{f}	3720 ^{g}	4712 ^{h}	3.09	< 0.0001
Labor cost	120 ^{a}	155 ^{b}	190 ^{c}	226 ^{d}	88 ^{e}	115 ^{f}	141 ^{g}	167 ^{h}	1.59	< 0.0001
Veterinary care	41 ^{a}	53 ^{b}	65 ^{c}	77 ^{d}	30 ^{e}	39 ^{f}	48 ^{g}	57 ^{h}	0.05	< 0.0001
Miscellanies	22 ^{a}	29 ^{b}	35 ^{c}	42 ^{d}	16 ^{e}	21 ^{f}	26 ^{g}	31 ^{h}	0.03	< 0.0001
Farm rent	105 ^{a}	135 ^{b}	164 ^{c}	194 ^{d}	77 ^{e}	104 ^{f}	120 ^{g}	146 ^{h}	0.18	< 0.0001
Total cost	9231 ^{a}	10402 ^{b}	11701 ^{c}	13127 ^{d}	8440 ^{e}	9311 ^{f}	10265 ^{g}	11323 ^{h}	4.09	< 0.0001
Outputs (LE)										
Selling Price	9600 ^{a}	10800 ^{b}	12000 ^{c}	13200 ^{d}	9600 ^{a}	10800 ^{b}	12000 ^{c}	13200 ^{d}	0.00	< 0.0001
Manure price	219 ^{a}	283 ^{b}	348 ^{c}	412 ^{d}	161 ^{e}	209 ^{f}	257 ^{g}	304 ^{h}	0.29	< 0.0001
Total income	9819 ^{a}	11083 ^{b}	12348 ^{c}	13612 ^{d}	9761 ^{e}	11009 ^{f}	12257 ^{g}	13504 ^{h}	0.29	< 0.0001

Different superscripts between values within the same row differed significantly

Table (4): Economic indicators (LE, LSM ± SE) of Baladi fattening herds with interaction between average daily gain of 850& 1150g and marketing weight (MBW) of 400 -550 kg (n=500 head/ herd)

Trait	MBW (kg) of 850 g/day (H1)				MBW (kg) of 1150 g/day (H2)				±SE	Pr > F
	400	450	500	550	400	450	500	550		
Total cost (LE)	9231 ^{a}	10402 ^{b}	11701 ^{c}	13127 ^{d}	8440 ^{e}	9311 ^{f}	10265 ^{g}	11323 ^{h}	4.09	< 0.0001
Total income (LE)	9819 ^{a}	11083 ^{b}	12348 ^{c}	13612 ^{d}	9761 ^{e}	11009 ^{f}	12257 ^{g}	13504 ^{h}	0.29	< 0.0001
Economic indicators										
Gross margin (LE)	587 ^{a}	681 ^{b}	647 ^{c}	485 ^{d}	1321 ^{e}	1698 ^{f}	1992 ^{g}	2182 ^{h}	4.230	< 0.0001
Output /input ratio	1.06 ^{a}	1.07 ^{b}	1.06 ^{c}	1.04 ^{d}	1.16 ^{e}	1.18 ^{f}	1.19 ^{g}	1.19 ^{h}	0.001	< 0.0001
Net profit per cycle (%)	6.4 ^{a}	6.6 ^{b}	5.5 ^{c}	3.7 ^{d}	15.7 ^{e}	18.2 ^{f}	19.4 ^{g}	19.3 ^{h}	0.050	< 0.0001
Return of investment (%)	11.6 ^{a}	9.2 ^{b}	6.4 ^{c}	3.6 ^{d}	38.8 ^{e}	34.9 ^{f}	30.2 ^{g}	25.3 ^{h}	0.060	< 0.0001
Cost of producing kg gain	18 ^{a}	19 ^{b}	20 ^{c}	22 ^{d}	13 ^{e}	14 ^{f}	15 ^{g}	16 ^{h}	0.010	< 0.0001
Fattening cycles characteristics										
Fattening period per cycle (day)	200 ^{a}	258 ^{b}	317 ^{c}	376 ^{d}	147 ^{e}	191 ^{f}	234 ^{g}	278 ^{h}	0.270	< 0.0001
Number of fattening cycles / year	1.83 ^{a}	1.41 ^{b}	1.15 ^{c}	0.97 ^{d}	2.48 ^{e}	1.91 ^{f}	1.56 ^{g}	1.31 ^{h}	0.003	< 0.0001

Different superscripts between values within the same row differed significantly

Effect of culling rate on herd profitability

Economic indicators of Baladi fattening herd with ADG of 750 g (ROI is positive however, less than the bank interest rate, Table 2) indicated that total

cost decreased (P<0.0001) with increasing culling rate (from 5 to 20%). This resulted in improving all the economic indicators (Table 5). Under the present assumption ROI started to be more than annual bank interest under culling rate of 15% (8.3%) and reaching its maximum at culling rate of 20% (12.3%). Moreover, the cost of producing kg gain was reduced by 7.3 and 11%, under culling rates of 15 and 20%, respectively.

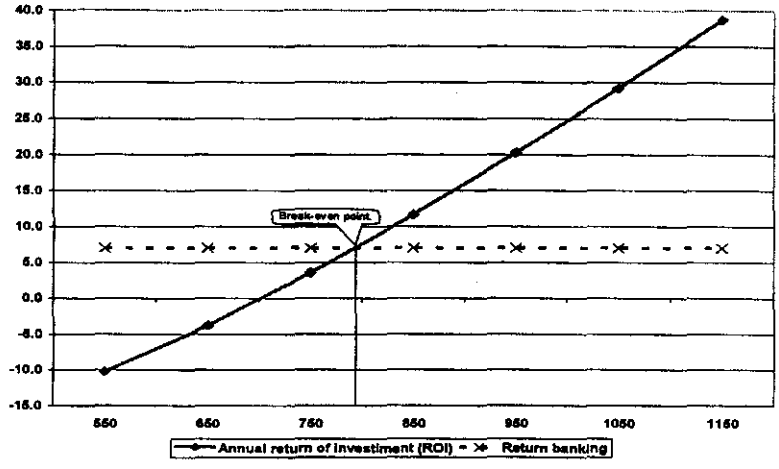
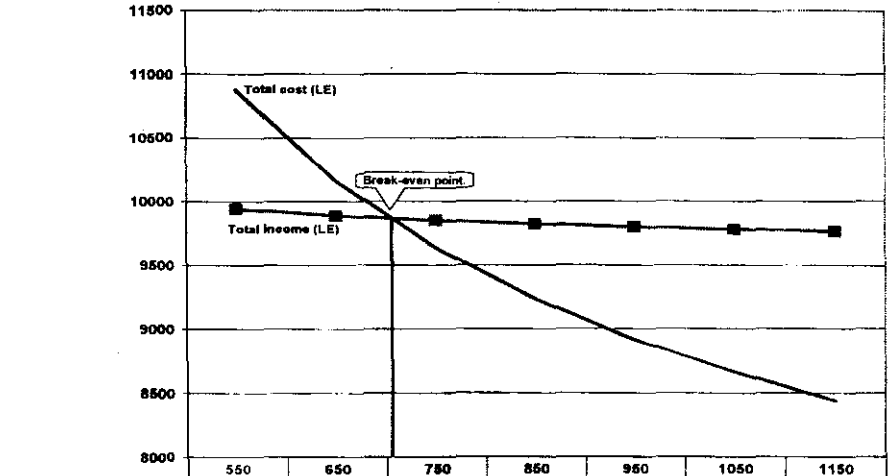


Figure (1): Break-even point of fattening Baladi enterprise as affected by average daily gain.



	550	650	750	850	950	1050	1150
Total cost (LE)	10881	10162	9635	9230	8911	8658	8440
Total income (LE)	9938	9886	9848	9818	9795	9777	9761

Figure (2): Return of investment of fattening Baladi enterprise compared to annual bank interest rate as affected by average daily gain.

Table (5) : Effect of culling rate(%) on profitability (least squares means ± SE)of Baladi herds with average daily gain of 750 g (n=500 head)

Traits	Culling rate (%)					± SE	Pr > F
	0	5	10	15	20		
Total cost (LE)	11009[a]	10773[b]	10559[c]	10358[d]	10163[e]	47.2	<0.0001
Total income (LE)[2]	11124[a]	10956[b]	10869[b]	10854[b]	10840[b]	39.4	<0.0001
Gross margin (LE)	115[a]	183[a]	310[b]	496[c]	676[d]	37.7	<0.0001
Net profit per cycle (%)	1.24[a]	1.87[a]	3.4[b]	5.8[c]	8.1[d]	0.48	<0.0001
Return of investment (%)[3]	1.52a	2.43a	6.64b	8.3c	12.31d	2.98	< .0001
Output/ input ratio[4]	1.01[a]	1.02[a]	1.03[b]	1.06[c]	1.08[d]	0.01	<0.0001
Cost of kg gain (LE)	21.8[a]	22.7[ab]	21.2[b]	20.2[c]	19.4[d]	0.21	<0.0001
Fattening period per cycle (day)	296[a]	280[b]	266[c]	252[d]	239[e]	3.16	< .0001

[1] 0.0 served as a control with no culling; [2] calculated as marketing body weight of 400 kg, [3] calculated as the number of fattening cycle per year is 1.61 (Table 4), [4] calculated per cycle

Means within row with different superscripts differ significantly at P<0.05

Under the scenarios of culling rate proposed in the present study ADG increased to be 758.1 ± 3.02, 764.63 ± 2.83, 770.58 ± 2.68 and 776.25 ± 2.56 g for culling rate of 5,10,15 and 20%, respectively, which led to increase the economic return. This is due the shift of the distribution curve to the right (Figure 3).

Prediction equations of some economic indicators of Baladi herd

Using ADG four prediction equations were formulated to estimate cost of producing 1 kg gain (LE), net profit / cycle (%), gross margin (LE) and output / input ratio, with accuracy of not less than 90.8 % (Table 6).

Table (6): Prediction equations of some economic indicators of Baladi herd

Trait	Prediction equation	R^2	Pr > F
Cost of producing 1 kg gain (LE)	43.392 + ADG * (-0.026)	0.915	< 0.0001
Net profit / cycle (%)	-38.596 + ADG * 0.052	0.965	< 0.0001
Gross margin (LE)	- 4330.312 + ADG * 0.746	0.908	< 0.0001
Output / Input ratio	0.614 + ADG * 0.001	0.965	< 0.0001

Prediction equations indicate that increasing ADG by 100 g leads to an increase in output/input ratio by 0.052, gross margin by LE 574.57, net profit per cycle by 5.22 % and to decrease cost of producing 1 kg gain by LE 2.8.

DISCUSSION

Feeding cost is the key element that determines the fattening herd's profitability under Egyptian system of fattening Baladi calves. This suggestion is supported by the findings of El-Asheeri *et al.* (2008), who found that benefit/cost ratio increased by 6% when 25% of concentrates feed mixture was replaced by corn silage. The obtained proportion of feeding cost for producing one kg gain (90.5%, Table 1) is close to that reported for fattening Baladi calves under the Egyptian circumstances (feeding on concentrate feed mixture and rice straw) by El-Asheeri (2008) and El-Asheeri *et al.* (2008),

reporting a percentage of feeding cost between 91and 94.8 % out of total running cost.

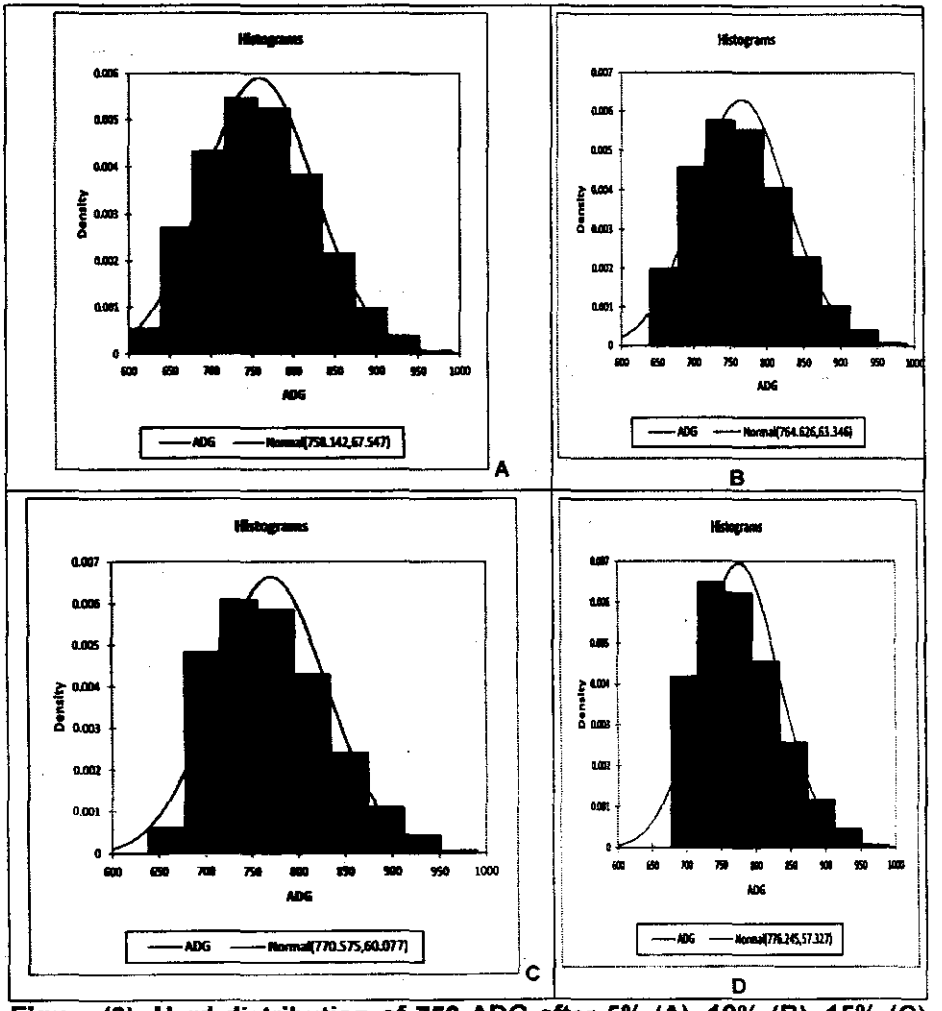


Figure (3): Herd distribution of 750 ADG after 5% (A), 10% (B), 15% (C) and 20% (D) culling rate

The present percentage of feeding cost was higher than that reported by Tolba (2000) on Baladi calves (70%) and Kopeček *et al.* (2009) (50%), which may be due to the price of feeding stuff and or feeding on mixture of concentrate feed and green fodder. This suggestion is supported by the findings of El-Asheeri *et al.* (2008) indicating a reduction in feeding cost by about 2.5% when replacing 25% of the concentrate feed mixture by corn silage.

Increasing net profit with increasing ADG (Table 2), comes in agreement with the findings of Kopeček *et al.* (2009) reporting that the break-

even point between cost of producing one kg gain and ADG is between 0.9 and one kg. The obtained output/input ratio at ADG of 0.950 kg is (1.1, Table 2) is similar to that reported by El-Asheeri (2008) and El-Asheeri *et al.* (2008), while the corresponding value obtained at 0.750 kg (1.02, Table 1) is less that that reported by El-Asheeri *et al.* (2008) for the same breed (1.16). The difference in the estimates are most probably attributed to the considered items of inputs between the two studies. The obtained break-even point (point of zero profitability is between 0.65 and 0.75 kg ADG (Table 2), is less than that reported by Kopeček *et al.* (2009), between 0.9 and 1.0 kg.

El-Asheeri *et al.* (2008) studied the growth curve of fattening Baladi calves from 230 kg to 450 kg. The authors found that under overall mean of ADG of 890 g the growth curve started to show the descending phase at 400 kg BW after which ADG started to decrease. This may mean that Baladi calves approaching sexual maturity around that body weight of 400kg. Hence, increasing cost of producing 1 kg gain with increasing marketing body weight from 400 to 550 kg (Table 4) could be attributed to decreasing ADG (El-Asheeri, 2008 and El-Asheeri *et al.*, 2008) low feed efficiency with age progress (Aksoy *et al.*, 2008) or due to the high energy required to produce kg gain with age progress (Koch *et al.*, 1979).

The exponential increase in output/input ratio in H2 (ADG =1150 g), relative to H1 of ADG of 850 g (Table 4), is most probably attributed to the higher growth rate of H2, which may lead to reach 550 kg marketing body weight at an earlier age relative to H1. The descending trend in output/input ratio in H1 with increasing marketing weight (Table 4) agrees with the findings of El-Asheeri (2008), who reported output/input ratio of 1.12 for marketing body weight of 400 *vs.* 1.1 for marketing weight of 450 kg.

The higher ROI in both studied herds of ADG of 850 and 1150 g, at marketing body weight of 400 kg relative to the other studied marketing body weight (450-550 kg, Table 4) comes in agreement with the findings of El-Asheeri (2008) who reported that under ADG of about 900 g marketing body weight at 400 kg achieve higher return per year by 0.3 %.

In conclusion, ADG of less than 850g is not profitable if compared with annual bank interest rate. MBW of 400 kg and early culling rate of 15% are two scenarios to maximize the ROI of Baladi fattening enterprise. Increasing ADG by 100 g at herd level increases net profit per cycle by 5.22 % and decreases cost of producing 1 kg gain by 3.6%.

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العائد الاقتصادي الأمثل لقطعان العجول البلدية المسمنة وعلاقته بمعدل النمو اليومي ووزن التسويق

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أجريت هذه الدراسة بغرض تحديد أعلى أربحية لقطعان العجول البلدية المسمنة تحت الظروف المصرية وعلاقة العائد الاقتصادي بمعدل النمو اليومي، مع تحديد أفضل السيناريوهات التي تحقق أعلى عائد من نشاط تسمين العجول البلدية. تمت محاكاة سبعة قطعان (٥٠٠ رأس / قطيع) من العجول البلدية موزعة توزيعاً طبيعياً بوزن بداية للتسمين ٢٣٠ كجم، ووزن نهاية التسمين (وزن التسويق) ٤٠٠ كجم ، وكان متوسط معدل النمو اليومي المقترح للقطعان السبعة هو ٥٥٠، ٦٥٠، ٧٥٠، ٨٥٠، ٩٥٠، ١٠٥٠، ١١٥٠ جم / يوم

اعتماداً على نتائج التجربة السابقة، تم اختيار اثنين من السيناريوهات لاختبار معظمة العائد الاقتصادي أولاً : اختبار وزن التسويق الذي يحقق أعلى عائد على الاستثمار سنويا، وثانياً معدل الاستبعاد من القطيع الذي يحقق عائد اقتصادي إيجابي للقطعان الخاسرة كما تم اختبارها في التجربة الأولى. تم حساب أسعار المدخلات طبقاً للأسعار السائدة في عام ٢٠١٠، وتم حساب النسبة بين المخرجات : المدخلات، العائد الصافي (%)،العائد على الاستثمار(%)، الدخل الصافي، عدد دورات التسمين في العام وكذلك تكلفة إنتاج كيلوجرام زيادة في الوزن كمؤشرات اقتصادية.

اتضح من الدراسة زيادة نسبة المخرجات/ المدخلات (٠.٩١- ١.١٦)، العائد من الدورة (-٨.٦٣- ١٥.٦٧%)، العائد على الاستثمار(-١٠.٢٥- ٣٨.٦٦%) وذلك عند زيادة معدل النمو اليومي من (٥٥٠ جرام- ١١٥٠ جرام / يوم)، وهو ما أرتبط بانخفاض تكلفة إنتاج كيلوجرام نمو بمقدار ٥٢.٤%. وأظهرت القطعان ذات معدل نمو يومي ٧٥٠جرام قيما سالبة لكل من مؤشرات نسبة المخرجات / المدخلات، العائد الصافي من الدورة والعائد السنوي على الاستثمار، ومن ناحية أخرى فإنه عند مقارنة العائد على الاستثمار للقطعان السبعة مع عائد البنك السنوي (٧%)، أتضح أن أول معدل نمو يومي يحقق عائد سنوي مقارن مع النسبة البنكية يجب ألا يقل عن ٨١٠ جرام/يوم

أظهر العائد على الاستثمار اتجاهاً معاكساً مع زيادة وزن التسويق من ٤٠٠- ٥٥٠ كجم بغض النظر عن مقدار الزيادة اليومية، وهو ما يعني أن زيادة وزن التسويق عن ٤٠٠ كجم يقلل من العائد السنوي علي الاستثمار في قطعان تسمين العجول البلدية ، كما وجد ان نسبة العائد في القطعان ذات معدل النمو اليومي ٧٥٠ جرام تحسنت طرديا مع زيادة معدل الاستبعاد من ٥% إلى ٢٠%، حيث حققت نسبة الاستبعاد ١٥% عائد أعلي من عائد الاستثمار البنكي (٩.٣%).

من التجارب السابقة يمكن استنتاج أن معدل الزيادة اليومية أقل من ٨٥٠ جرام / يوم يعتبر غير مجدي اقتصادياً إذا ما قورن بفائدة البنك السنوية، كما أن التسويق على وزن ٤٠٠ كجم يعتبر الوزن الأمثل لتحقيق أعلي عائد اقتصادي، كما أن القطعان التي لا تحقق عائدا إيجابيا علي الاستثمار (٧٥٠ جرام/ يوم) يمكن من خلال الاستبعاد المبكر لنسبة ١٥% تحسين المؤشرات الاقتصادية لقطعان التسمين ، كما أوضحت معادلات التنبؤ أن ارتفاع معدل الزيادة اليومية بمقدار ١٠٠ جرام/ م على مستوى القطيع يرفع العائد الصافي من الدورة بمقدار ٥.٢٢% وتخفض تكلفة إنتاج واحد كيلو جرام وزن بمقدار ٣.٦%

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