

Economics of Raising Local Goat in Jordan

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Abstract: This study was conducted to investigate the economics of raising local goat in Jordan. The aim of the study is to determine if a business opportunity from goat raising is possible, practical and viable. Such study provides producers with information as to whether or not they can afford to do raise local goat as well as to successfully operate their business. Three important and traditional discounted financial indicators were used in the study, they are the Net Present Value (NPV), the Internal Rate of Return (IRR) and the Benefits to Costs ratio (B/C). The results of the study showed that all the indicators for financial feasibility analysis used in the study were positive and accepted. The study also investigated the impact of feed costs, market selling price and flock size on the profitability of this kind of investment. The results revealed that feed cost is with negative impact on local goat raising activity. In the other hand, both market selling price and flock size are with positive impact. This means that raising of local goat in Jordan is financially a feasible activity to be adopted. The study results encourage the internal and external investors to invest in this activity in Jordan. Further studies are needed in this area of investigation in Jordan.

Key words: Local goat, financial feasibility, net present value, internal rate of rreturn, benefits to costs ratio, profitability, regression

INTRODUCTION

Goat is a multi functional animal and plays a significant role in the economy and nutrition of landless, small and marginal farmers in the country. Goat rearing is an enterprise which has been practiced by a large section of population in rural areas. Goat make a valuable contribution to the livelihood of economically weaker sections of the society. The goat is a member of the Bovidae family and is closely related to the sheep as both are in the goat-antelope subfamily Caprinae. There are >300 distinct breeds of goat. Goats are ruminants. They have a four-chambered stomach consisting of the rumen, the reticulum, the omasum and the abomasum. As with other mammal ruminants, they are even-toed ungulates. The females have an udder consisting of two teats, in contrast to cattle which have four teats. Goats reach puberty between 3 and 15 months of age, depending on breed and nutrition status. Many breeders prefer to postpone breeding until the doe has reached 70% of the adult weight. However, this separation is rarely possible in extensively managed, open range herds (Payne and Wilson, 1999). When handled as a group, goats tend to display less clumping behavior than sheep

and when grazing undisturbed, tend to spread across the field or range, rather than feed side-by-side as do sheep. When nursing young, goats will leave their kids separated (lying out) rather than clumped as do sheep. They will generally turn and face an intruder and bucks are more likely to charge or butt at humans than are rams (Fowler, 2008). Goats in general play an important economic role in farming. Goats are one of the oldest domesticated species. They have been used for their milk, meat, hair and skins over much of the world (Hatziminaoglou and Boyazoglu, 2004). Goats produce approximately 2% of the world's total annual milk supply. Some goats are bred specifically for milk. If the strong-smelling buck is not separated from the does, his scent will affect the milk (FAO, 2009).

It is efficient in utilization of low-quality roughage (Knights and Garcia, 1996). Goats are important for the provision of animal protein and as a source of income to small holders in the less developed parts of the world (Mahgoub, 1997). Meat production of goats is influenced by many factors including sex, breed, age and nutritional status. Genetic factors and levels of feeding are probably the most important factors influencing growth and thus meat production (FAO, 1999). Goats are invariably marketed at younger age usually at about 1 year

(Aschalew *et al.*, 2000). The aim of investigating economics of any production sector is considered to be to a certain degree a feasibility study. The aim of any feasibility study is to determine if a business opportunity is possible, practical and viable. A financial feasibility analysis provides decision-makers as well as the producers information as to whether or not they can afford to do the project as well as successfully operate it once constructed.

Profit margins in agricultural enterprises tend to be small but it is possible to make a profit raising goats, particularly if costs are controlled and returns from marketing are maximized. In the goat enterprise, profit is expressed in many different ways: income above variable costs, income above fixed costs, profit per head, profit per month and return on assets (investment), etc.

Status of goat industry in Jordan: Goats in Jordan belongs to several breeds and their crosses. These breeds are Shami (Damascus) goat, Mountain Black goat, Dhawi goat and Desert goat. Crossbred goat tends to have been produced from continuous crossing between Mountain and Shami goats (Al-Rousan, 2009).

Jordan has recorded increased number of local goat. The total number of local goats in Jordan according to the results of the livestock survey in the 1st of November, 2009 conducted by the Ministry of Agriculture (MOA) estimated to be 900,430. The value of physical inputs in thousand Jordanian Dinars or (JDs) used in livestock production (including goats) and the value of other expenditures for livestock production in Jordan (including goats) estimated to be 608,482 [1 JD = 1.4 USD] in 2009. The value of sheep, goat and uncategorized cattle holdings production for the same year estimated to be 270,488 thousand JDs from 770,660 thousand JDs (about 35%) of livestock production in the country. The previous numbers show the importance of livestock production (including goat production) in the country as well as the contribution of this sector to the national production. In Jordan, the average profit per head of goat is around 23 JDs and the total production costs per head were around 56 JDs. Similar results obtained by Alnsour (1993). Alnsour stated that the average profit per head of goat is around 24 JDs. He also stated that the NPV, the IRR and the b/c ratio for average flock size of 44-90 heads of goat were 26454 JDs, 0.68 and 1.23, respectively. No economic detailed studies covered this area of small ruminant production (goat production) in Jordan, since Alnsour and Strobel studies.

The goat industry in Jordan has not yet to be firmly laid down on scientific lines. Goat keepers are maintaining goats in all kinds of situations depending upon the

ecology and their circumstances. The minimum goat unit could consist of one goat and the maximum could go to <100 under range management.

The following could be considered as the technical constraints for securing a thriving goat industry in the country:

- Non-availability of high-yielding breeding stock
- Low level of nutrition and managerial efficiency
- Lack of definition of the production objectives
- Limited attention to application of the modern techniques for improving the reproductive efficiency, e.g., AI, synchronization of estrous, semen freezing, etc.
- Limited use of outstanding exotic breeds for improvement
- Lack of knowledge on successful rearing of kids
- Housing for goats in different eco-zones requires a very elaborate and systematic study
- Organized marketing is very limited. This has resulted in unscrupulous exploitation by the middle-man who is often seen moving with the goats along the migratory routes

MATERIALS AND METHODS

Data collection: A survey was conducted by personal interview with communal farmers in the whole country. A structured questionnaire was designed to obtain information from respondents on socio-economic profiles, total variable costs, annual revenues, net income, animal productivity and goat utilization and marketing profiles. These items were broken down to their corresponding subtitles. The questions were posed the language of the respondents. A sample of 100 households was selected at random using random number tables. The secondary data sources to achieve the study objectives include mainly the Department of Statistics and Ministry of Agriculture. The average size of the flock was 100 heads.

Data analysis: The total fixed and variable costs as well as the total annual revenues were calculated on yearly basis. Averages of the costs and revenues were calculated to be considered the core of the analysis in the determination of the financial feasibility and other economic considerations of goat production in Jordan.

The NPV, IRR and the B/C ratio are the financial indicators used in the study. Factors affecting profitability of the local goat enterprise in Jordan were investigated through a regression model. All the included items in the analysis are based on the semi-intensive production system.

The financial indicators

The Net Present Value (NPV): The net present value, the internal rate of return and the benefits to costs ratio are three of the most beneficial financial indicators to be used in feasibility studies. The Net Present Value (NPV) is the present value of an investment's future net cash flows minus the initial investment. If positive, the investment should be made (unless an even better investment exists) otherwise it should not (Lin *et al.*, 2000).

Net Present Value (NPV) or Net Present Worth (NPW) is a standard method for using the time value of money to appraise long-term projects. Used for capital budgeting and widely throughout economics, it measures the excess or shortfall of cash flows in present value terms, once financing charges are met (Lin *et al.*, 2000). Each cash inflow/outflow is discounted back to its Present Value (PV). Then, they are summed. Therefore, NPV is the sum of all terms Eq. 1:

$$\frac{R_t}{(1+i)^t} \tag{1}$$

Where:

- t = The time of the cash flow
- I = The discount rate (the rate of return that could be earned on an investment in the financial markets with similar risk)
- R_t = The net cash flow (the amount of cash and inflow minus outflow) at time t

If NPV>0 then the investment would add value to the firm and the project may be accepted. If NPV<0 then the investment would subtract value from the firm and the project should be rejected. If NPV = 0 then the investment would neither gain nor lose value for the firm and we should be indifferent in the decision whether to accept or reject the project.

The Internal Rate of Return (IRR): The internal rate of return is useful number to know when you are evaluating an investment. It is often assumed that higher is better for both of the net present value and the internal rate of return. In particular, it usually stated that investments with higher internal rates of return are more profitable than investments with lower internal rates of return (Baker, 2000). IRR can be used to rank several prospective projects a firm is considering. Assuming all other factors are equal among the various projects, the project with the highest IRR would probably be considered the best and undertaken first.

The Internal Rate of Return (IRR) also called Discounted Cash Flow Rate of Return (DCFROR) or Rate of Return (ROR) is an indicator of the efficiency or quality of an investment as opposed to Net Present Value (NPV)

which indicates value or magnitude (Bruce, 2003). IRR is the discount rate that generates a zero net present value for a series of future cash flows. Internal rate of return provides a simple hurdle rate, whereby any project should be avoided if the cost of capital exceeds this rate. IRR can be mathematically calculated using the following Eq. 2:

$$CF_0 + \frac{CF_1}{(1+r)^1} + \frac{CF_2}{(1+r)^2} + \frac{CF_3}{(1+r)^3} + \frac{CF_n}{(1+r)^n} = 0 \tag{2}$$

In Eq. 2, CF is the Cash Flow generated in the specific period (the last period being n). IRR denoted by r is to be calculated by employing trial and error method. IRR is the flip side of Net Present Value (NPV) where NPV is the discounted value of a stream of cash flows generated from an investment. IRR thus, computes the break even rate of return showing the discount rate below which an investment results in a positive NPV.

The Benefits to Costs ratio (B/C): A cost benefit ratio analysis (BCA) is helpful in making the determination of where your maximal profit margin occurs. BCA analysis is commonly used to evaluate the economic feasibility of traditional public expenditures (Orth *et al.*, 1998). BCA is a process by which business decisions are analyzed (Bent *et al.*, 2002). The benefits of a given situation or business related action are summed and then the costs associated with taking that action are subtracted (Boardman *et al.*, 2001). B/C ratio is the ratio of the total present value of benefits during the service life of the project to the total present value of the costs at the MARR. A project is accepted for investment if B/C ratio is ≥1 and rejected otherwise. A Benefit-cost Ratio (BCR) is an indicator used in the formal discipline of cost benefit analysis that attempts to summarize the overall value for money of a project or proposal. A BCR is the ratio of the benefits of a project or proposal expressed in monetary terms relative to its costs also expressed in monetary terms. All benefits and costs should be expressed in discounted present values (Ascott, 2006).

The Regression model: In Jordan, the most important factors affecting profitability of the local goat enterprise include feed costs and market selling prices. Feed represents approximately, 70% of the total costs of raising goats. Producers can control feed costs by maximizing the use of pasture and browse producing their own harvested feeds, mixing their own rations, shopping around for feed ingredients, buying and storing feed in bulk, minimizing feed wastage and weighing all feed inputs. Market selling prices per a head is with a significant impact on enterprise profitability. The goal should be to sell with the highest

price. Market prices vary according to the size and quality of the animal sold and the demand in the market place. On farm sales of local goats usually generate greater profit than sales at livestock auction barns or to brokers. Prices may be better at larger, more distant auctions but the added transportation costs needs to be factored into the price to determine where the best place to sell goats is. A lack of a developed nationwide marketing system in Jordan caused seasonal price fluctuations and wide variations by location. Goat meat is favored by many Jordanians. However, with goat meat demand steadily increasing and domestic producers raising more goats to meet this growing appetite, market outlets such as livestock sales auctions are becoming more common but not enough. A Regression model was used to investigate the previously mentioned two factors affecting profitability of the local goat enterprise in Jordan.

RESULTS AND DISCUSSION

Production costs: Three general types of costs comprise the total cost of producing any type of farm commodity. They are variable (operating), fixed and overhead expenses. Overhead expenses (also known as indirect costs) are difficult to allocate among individual enterprises. Examples include telephone, electricity and accounting services. Overhead expenses are included in whole-farm budgets but are generally excluded in enterprise budgets.

Variable costs: Variable costs are those operating inputs that vary as the level of production changes. They are items that will be used during one operation year or one production period. Examples include feed, fuel, vet medicine and supplies. They would not be purchased if production were not undertaken. Variable costs may also be classified as cash or non-cash in nature. For instance, labor expenses are included in the operating input. No differentiation between owner supplied or hired labor is assumed. If the farm operator or a family member supplies labor, a wage rate or salary that represents earnings if employed elsewhere would be shown. This illustrates one of the most important concepts in economics opportunity costs. Every resource used in the production process has one true cost, its opportunity cost. The opportunity cost of labor is the return the resource can earn when put to its best alternative.

Fixed costs: Fixed costs are not affected by short-term enterprise decisions and do not vary with the level of production. Generally, fixed costs are those ownership costs associated with buildings, machinery and

Table 1: Total fixed costs (100 heads)

Items	Total cost (JDs)
Land and buildings	12000
Machinery and equipment	10000
Flock (100 heads)	11000 (110 JDs head ⁻¹)
Total	33000

Table 2: Total variable costs (100 heads)

Items	Total cost (JDs)
Feed	8200 (82 JDs head ⁻¹)
Wages	6800
Veterinary services	500
Other (unspecified)	500 (Fuel, water ...)
Total	16000

Table 3: Total returns

Items	Total returns (JDs)
Milk	3500 (70 does; [1 kg/does/200 days]/2)×0.5 JDs
Cheese*	4800 (70 does; [1 kg/does/200 days]/2)/5×6 JDs
Hair	1000
Manure	1000
Kids and bucks	5000
Culling	1000
Total	16300

*Converting ratio: 5 kg milk/1 kg cheese; 50% kid crop, 10% kid death loss, 20% doe replacement rate

equipment that are pro-rated over a period of years. Fixed costs may also be cash or non-cash in nature. Real estate taxes, personal property taxes and insurance on buildings are examples of cash fixed costs. Non-cash costs include depreciation and interest on capital investment.

Depreciation represents an attempt to spread the investment costs or purchase price of durable assets over their productive lifetime. It is typically the largest cost associated with asset ownership. A sample of fixed and variable costs for the first year of business considering a herd size of 96 does and 4 bucks is shown in Table 1 and 2. Returns of the same flock are shown in Table 3. The previous costs and returns were proposed based on the following assumptions:

- The purchasing price of the doe is 110 JDs
- The kid crop is 90%
- The twinning percentage is 20
- The mortality rate is 2%
- The culling percentage is 5
- The replacement percentage of the does is 20 (50 JDs head⁻¹)
- The replacement percentage of the female kids is 20 (25 JDs head⁻¹)
- The replacement percentage of the male kids after fattening is 60 (90 JDs head⁻¹)
- The milking period is 200 days
- The manure production is 3 JDs/year/head
- The hair production is 1.5 kg year⁻¹ with 1 JD kg⁻¹
- The does percent in the flock is 70% from which 90% are milking

- The total costs are increasing by 5% year⁻¹ and the returns are increasing by 15% year⁻¹
- Calculations based on a discount rate is 8%

Table 4 shows the costs, returns and cash flow of the proposed project of 100 heads of goats for a period of 10 years.

The financial indicators: Table 4 shows the results obtained from calculating the investigated financial indicators. As shown in Table 5, according to the net cash flows estimated in Table 3, the Net Present Value (NPV) value was positive and equal to 15993.98 JDs. The Internal Rate of Return (IRR) was approximately 16%.

The Benefits to Costs ratio (B/C) was approximately 1.3. These values of the three financial indicators are encouraging to go forward and invest in goat raising in Jordan. The NPV is positive and acceptable value. Concerning the Internal Rate of Return (IRR), its value was estimated to be 16%. An investment is considered acceptable if its IRR is greater than an established minimum acceptable rate of return or cost of capital. Here, IRR is more than the cost of capital and acceptable, especially if we think of IRR as the rate of growth a project is expected to generate. A 16% is not so high rate of growth compared to other possible rates in other similar investments with approximately, the same outflows but still accepted. The benefits to costs ratio is not so high for this investment but again it is accepted. A project is accepted for investment if B/C ratio is ≥1 and rejected otherwise. This ratio attempt to identify the relationship between the cost and benefits of a proposed project. The value of B/C for goat raising project in Jordan is approximately 1.3. This value indicates that the benefits of this project will outweigh the actual costs that go into the creation of the project with only 0.3.

Table 4: Costs, returns and cash flow of the proposed project (100 heads)

Years	Total fixed costs (JDs)	Total variable cost (JDs)	Total costs (JDs)	Returns (JDs)	Cash flow (JDs)
1	33000	16000.00	49000.00	16300.00	-32700.000
2		17600.00	17600.00	18745.00	1145.000
3		18760.00	18760.00	21556.75	2796.750
4		20636.00	20636.00	24790.26	4154.263
5		22672.30	22672.30	28508.80	5863.499
6		24939.23	24939.23	32785.12	7845.890
7		27433.15	27433.15	37702.89	10269.740
8		30176.47	30176.47	43358.32	13181.860
9		33194.12	33194.12	49862.07	16667.950
10		36513.53	36513.53	57341.38	20827.850

Table 5: The financial indicators

Indicators	Values
NPV (JDs)	15993.980
IRR (%)	16.000
B/C ratio	1.296

Payback is 1.3 times the costs. This means that for every unit of cost, researchers get 1.3% units of benefit. Again this is encouraging.

The Regression model: A Regression model was used to investigate three of the most important factors affecting profitability of the local goat enterprise in Jordan. They are feed costs, market selling price per head and flock size. Further investigation on other factors that affect the revenue obtained from those animals that raised under semi-intensive production system in Jordan is needed. This system is practiced by village dwellers and residential centers.

A production function relating goat revenue as independent variable with respect to three explanatory variables; feed costs, market selling prices and flock size. An attempt was made to construct a model that holds all these variables in a form of multiple regression as follows:

$$Y = \alpha + \beta x$$

With the three explanatory variables, x1 (feed costs), x2 (market selling price) and x3 (flock size), the equation is as follows Y here represents profitability:

$$Y = \alpha + \beta_1 x_1 + \beta_2 x_2 + \beta_3 x_3$$

It is customary to replace α with β_0 and so the regression equation could be written as:

$$Y = \beta_0 + \beta_1 x_1 + \beta_2 x_2 + \beta_3 x_3$$

Results from OLS regression based on the specified model of the previous equations are shown in Table 5 and 6. According to the results showed in Table 6 and 7, the regression equation is:

$$Y = 36.5 - 0.33 x_1 + 0.124 x_2 + 0.018 x_3$$

Goodness of fit is acceptable with an R² of (0.83) and a significant F-test value (12.5). The signs and magnitudes

Table 6: Analysis of variance

	df	SS	MS	F-value
Regression	3	770.6696	256.88990	12.54415
Residuals	96	1965.9700	20.47886	-
Total	99	2736.6400	-	-

Table 7: Least square regression results

Variables	Parameters	t-values
Intercept	36.52040	3.354532
Feed cost	-0.32702	-5.581366
Market selling price	0.12356	2.531549
Flock size	0.01799	0.281760

of the estimated coefficients are broadly in line with theoretical expectations. In summary, tests for model adequacy are satisfactory. All the parameters are significantly >0 at the 5% level with the exception of feed cost. This implies that two of the three investigated variables have a direct affect on profitability; market selling price and flock size. Feed cost is negatively related to profitability. That is if feed cost increased by 10%, profitability will decrease by 3.2%. For the other two variables the relation is positive. A 10% increase in market selling price will increase profitability by 1.2% and a 10% increase in flock size will increase profitability by almost 0.2%.

CONCLUSION

This study investigated the economics of raising local goat in Jordan. The aim of the study was to determine if a business opportunity from goat raising is possible, practical and viable.

The study has revealed that the Net Present Value (NPV) is positive and acceptable. The Internal Rate of Return (IRR) was estimated to be 16%. It is more than the cost of capital and acceptable, especially if we think of IRR as the rate of growth a project is expected to generate. The value of B/C for goat raising project in Jordan is approximately 1.3. This value indicates that the benefits of this project will outweigh the actual costs that go into the creation of the project with only 0.3. Payback is 1.3 times the costs. This means that for every unit of cost, researchers get 1.3% units of benefit. Again this is encouraging.

The values of the previous three indicators hence, the local goat raising investment were affected by three important factors; feed costs, market selling price and flock size. Feed cost is with negative impact on local goat raising activity. In the other hand, both market selling price and flock size are with positive impact.

RECOMMENDATIONS

- As feed cost and adequacy is a major problem in local goat raising in Jordan, it is very important to utilize range lands in a planned manner. The government should apply a scheme to implement such manner. This is very necessary to maintain adequate animal performance during periods of nutritional stress
- Application of improved veterinary technology for improving heard health to increase kidding rates, weaning rates and rates of gain is crucial
- Where cost benefit ratios seem favorable, practice kid

creep feeding for improved gains and condition to enhance market appeal and returns

- Assessment of cost benefit ratios of applying various improved management practices to herds currently managed in the traditional, low input/low output manner is needed
- Quantification of demand for goat meat in the country and correlation of price spreads among players in the marketing channels for goats is needed
- University research and extension programs in production, processing and marketing of goat meat are scarce and should be implemented and sustained too

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