ECONOMIC COEFFICIENTS OF IMPORTANT PRODUCTIVE TRAITS OF SHEEP IN RURAL AND INDUSTRIAL SYSTEMS

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ABSTRACT

The aim of the current study was to investigate effects of 5 important productive treats of sheep include birth, 3 and 6 months of age weight; twining and fertility in two rural and industrial systems using bio-economic model in Kabudeh Fars and Zel Mazandran sheep. According to the obtained results, suggests that by change in rural raising system to industrial type, there was no significant effects on economic coefficients values and routine genetically selection can be follow using the change in rural to industrial raising system. Additionally, body weight in 6 and 3 months of age, birth weight, twining with mean relative economic coefficients (3 flock and 3 raising system) were 4.07, 3.7, 1 and 0.84, respectively.

Key Words: Economic Coefficients, Bio-economic Model, Rural and Industrial Systems, Sheep

INTRODUCTION

The aim of the genetic selection is to select productive animals for participate in the next generation to promote animal production than the current generation [5, 7, 9, 18, 20]. The main purpose of selection programs is to select the most prominent and effective animals which are able to transmit highest bio-economic value to the next generation [10, 11, 14]. Without take part and compare the relative traits values, we were not able to

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choose the suitable way to determine relative traits values and their economical profits [19, 20]. Previously, Vatankhah [4] reported to investigate generation selection in Lori-Bakhtiyari sheep in rural raising system, it is better to determined several factors include: economical coefficients of pregnancy rate, number of lamb in birth, ewe body weight, wool weight, survival until milk withdrawal, survival until 6 months of age, live body weight (LBW) until 6 months after birth, body carcass rate, fat to carcass ratio, fat weight in 6 months of age, carcass weight without fat in 6 months of age. In this study, based on the hypothesis which there is no difference among animals for selected traits in economical coefficients, authors thought there is no need to use a constant model. In this regards, Kasji et al., [15] reported to improve breeding in meat type sheep for tropical farms, it is beneficial to determine economical coefficient of number of lamb in born, lambing, survival before milk withdrawal, survival after milk withdrawal, ewes survival, LBW in12 months of age, puberty weight of rams, carcass shrinkage and residual feed intake. Based on previous studies, the main hypothesis of current study was to investigate economical coefficient of main productive traits in both rural and industrial breeding systems in Kabudeh Fars and Zel Mazandran sheep in Iran.

MATERIAL AND METHODS

The data used in this study is belongs to 2 main Iranian sheep strain named Kabudeh-Fars in Marvdasht region and Zel Mazandaran in Mazandaran province. Bioilogical data include: flock body weight, reproductive, survival and economical traits e.g. feeding and cure expenses and incomes.

Introducing the Data to the Model

1. Rural Breeding System

In this study biological data: time table of food stuff usage (pasture, stall feeding and birth date) and some economic data collected by answer sheet forms that provided to the flock owners. Then the desired flocks selected as a powerful and constant flocks under supervision of Iranian Breeding Organization. The main concern was to determining bio-economic model in realistic condition in rural system. The ideal condition (availability of nutritional requirements based on NRC suggestions) used just as a basement indicator to estimate nutritional costs and income from dung. It is important to note that the real data which obtained from the farmers used in bio-economic model.

1. Industrial Breeding System

In this system, data used as the same as rural breeding system.

Expenses and Profits of Sheep Industry Include

1. Feeding costs (forage and concentrate), farm (if it is not ownership). The data used in this study related to those moths of year which animals feed on farm or on rental lands. On the other moths, sheep feed on natural pastures and the flock owners just have to pay to rancher. This portion of cost is calculated in wage part while in industrial system animals feed by owners in 365 days of year.

2. Extra costs include: rancher wage, wool sniping, veterinary expenses, hygiene, vaccination, electricity, gas and water bills, and equipment repair costs e.g. car.

3. In both system (rural and industrial) farmer have to build stall. Despite in rural system animal kept only 100 days in stall (compared to industrial system, 365 days in stall); stall costs are same for both system.

4. Incomes include: ram or ewe marketing, wool and dung.

The Generation Renewing Cycle in this Study

In this study all ewe birth once a year, replaced by older animals in 18 months of age, excess lambs sold in 5 months of age and the initial age to breeding lamb for meat production was 3 months.

Calculation of System Profits

To calculate system profits, Microsoft excel software had used.

1. Flock sex in this study was: ewe, ram, 3, 6, 12 and 18 months lambs.

2. Calculation of income per a ewe in year has done using equation 1 [6, 7, 12, 15].

Equation 1: Income from each ewe

$$P_e = \sum_{i=1}^{6}\left[N_i \times f_i \times (1-m_i) \times Lw_i \times Pm_i\right] + \sum_{i=1}^{6}\left[N_i \times f_i \times C_i \times P_{w_i}\right] + \sum_{i=1}^{6}\left[N_i \times f_i \times O_i \times P_o\right]$$

P_e= income per ewe; i= Animal groups; N_i= number of animal in group i to donor ewe; f_i= fraction of animal in group i which have role in group profit; m_i= mortality rate in group I; Lw_i= LBW of animals in group i in marketing time; Pm_i= price of each Kg of LBW in in group I; C_i= wool production (Kg) of each animal in in group i; Pw_i= price of each Kg of wool in group i

3. Calculation of constant and inconstant costs per a ewe in year has done using equation 2, 3 and 4 [6, 7, 12, 15].

Equation 2: Nutritional costs

$$C_f = \sum_{i=1}^{6}\left[N_i \times (Rf_i \times L_i \times \mathrm{Pr}_i \times Z_i)\right] + \sum_{i=1}^{6}\left[N_i \times Ps_i\right]$$

N_i= number of animals in group i to donor ewe; Rf_i= total nutritional needs in hand feed system; L_i= days in hand feed system in group I; Pr_i= price of each unit of energy in ration of in group I; Z_i= ratio of provided energy from hand feed system in group I; Ps_i= price of pasture forages in group i

Equation 3: Nun-nutritional costs

$$C_h = \sum_{i=1}^{6}\left[N_i \times P_{lb} \times L_{mi}/100\right] + \sum_{i=1}^{6}\left[N_i \times C_{wc} \times Lmi\right] + \sum_{i=1}^{6}\left[N_i \times Wb \times L_{mi}\right] + \sum_{i=1}^{6}\left[N_i \times Sh\right]$$

P_{lb}= rancher wage per month for each 100 sheep;

L_{mi}= number of months animals kept in group I;

C_{wc}= hygiene and cure price of each animal; Wb= cost of water, electricity in month per animal; Sh= cost of wool sniping

Equation 4: Constant costs

$$C_{FCF} = \sum_{i=1}^{n}\left(P/S\right)$$

P= total investment in each unit which includes in constant prices; S= time duration of each unit includes in constant prices; i= units include in constant prices;

3. Calculation of yearly profit has done using equation 5.

Equation 5: Flock profit

$$P_{flock} = \left[N_f \times \left(R_f - C_f\right) - C_{FCF}\right]$$

P_{flock}= profit of flock in a year; N_f= number of donor ewe; R_f= income from each ewe per year; C_f= yearly costs of each donor ewe per year; C_{FCF}= constant cost of flock in a year

Calculation of Economic Coefficient

In this study, economic coefficient, when other traits was in mean, economic coefficient trait increased 0.1 and efficacy discrepancy determined as a base efficacy of trait and for each trait calculated using the below model [7, 16].

$$V_I = \frac{P_{\mu_I + \Delta} - P_{\mu_I}}{\Delta}$$

Where: V_I presents as economic coefficient, $P_{\mu_I + \Delta}$ mean animal profit after 1 genetically improvement in Trait (i), P_{μ_i} mean animal profit before 1 genetically improvement in trait and Δ rate of improvement in trait (i). In this study, Δ was as an increase in weight gain (Kg) for all traits. Using this method, absolute economic coefficient calculated and implies that 1 Kg increase in body weight is related to specific trait.

RESULTS AND DISCUSSION

To compare between economic coefficients of traits, absolute economic coefficient and relative economic coefficient determined. In this regard, twining economic coefficient used as a database (with less difference between systems). Relative economic coefficient calculated by division of absolute economic coefficient of each trait to economic coefficient of twining.

Birth Weight Trait

Mean absolute economic coefficient in rural and industrial systems were 65835 and 14144 Rls., respectively. Also, relative economic coefficients for rural and industrial systems were 1.14 and 0.28, respectively. Because of duration between genetic improvement in birth weight until marketing time, maintenance energy needs and growth rate are high, so the increased profit caused by meat to feeding is less than the other traits. In this case, there is significant difference in industrial system (feeding by person) to rural system (which more part of the feeding take places on farm). In contrast, Khodai [1] reported economic coefficient had no role in birth weight in Gilani sheep which our result is not parallel to it. Khodai [1] claimed that the main effector on economic coefficient in

Gilani sheep related to increase in birth weight to mortality rate in lamb and ewe, as well as nutritional costs. In this study, there was no report of Dystocia (difficult birth). Also, the nutritional cost in this study was less than previous report in Gilani ewes.

Three Months of Age Weight Trait

The mean economic coefficients of this trait in rural and industrial systems were 78205 and 20356 Rls., respectively. Relative economic coefficients of 3 months of age weight for rural and industrial systems were 1.36 and 0.4, respectively. This result suggests that the time duration from birth to lamb marketing diminished compared to LBW. Also, we have to notice that the lamb marketing age in rural system is 5-6 months post birth but for industrial system was 8-9 months. In this regard Khodai [1] detected that relative economic coefficient of milk withdrawal age in lab is the 2nd important trait and our result from rural system is similar to it. Formerly, Zahmatkesh [2] reported that relative economic coefficient of weight in 3 months of age in rural breeding system; the highest economic coefficient is after 6 months. Our obtained result is similar to it.

Six months of Age Weight Trait

Mean economic coefficient of this trait in both rural and industrial system is 96236 and 46660 Rls., respectively. Relative economic coefficient of weight in 3 months of age with relative mean was 1.67 and 0.92 for rural and industrial system, respectively. These results imply the importance of 2 first traits. Because, this trait is coincide with lamb marketing in rural system, weight of 6 months of age has highest coefficient compared to the other traits and it is why 98 percent of the offered meat to the market is from rural system. Moreover, Zahmatkesh [2] reported that weight of 6 months of age in rural breeding system has highest economic coefficient compared to other traits. Our data is constant to it.

Nine Months of Age Weight Trait

As previously mentioned in rural system lamb marketing is usual in 6 months of age. So, there was no calculated coefficient for it but because of coincidence of extra lamb marketing in industrial system, absolute and relative economical coefficient 72843 Rsl. And 1.44, respectively compared to the other traits.

Twining

Mean absolute economical coefficient in rural and industrial breeding system were 57607 and 50706 Rls., respectively. Because of that the relative economical coefficient was base calculation in to system to investigate other

traits, in both systems was 1. This trait was the lowest trait in rural system while in industrial system was beside the pregnancy rate in 3rd place.

Survival Before 6 Months of Age Trait

Mean economical coefficient for this trait in rural and industrial breeding system were 64762 and 50706 Rls., respectively. Relative economical coefficientfor survival before 6 months for rural and industrial systems was 1.12 and 1.14, respectively to the twining trait.

Pregnancy Rate Trait

Mean economical coefficient for pregnancy rate trait in rural and industrial breeding system were 62957 and 50708 Rls., respectively. Relative economical coefficient for survival before 6 months for rural and industrial systems was 1.00 and 1.09, respectively.

In conclusion, the highest place of economical coefficient of these traits was related to weight with lamb marketing in both systems which increases in time duration between genetic improvements until lamb marketing caused to decrease economical coefficient because of increase in feeding costs. Also, because of imbalance in nutritional and breeding expenses in industrial system, by reducing breeding costs and increase in nutritional costs compared to rural system, twining, pregnancy and survival rate increased whereas traits related to the weight especially those related to much more time duration until lamb marketing decreased.

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