Indian Journal of Animal Sciences **80** (11): 1138–40, November 2010

Economic values for different economic traits of Red Chittagong cows

M K I KHAN[1], G MIAH[2], M J KHATUN[3] and A DAS[4]

Chittagong Veterinary and Animal Sciences University, Chittagong 4202, Bangladesh

Received: 16 November 2009; Accepted: 5 September 2010

Key words: Economic values, Model, Profitability, Traits

Red Chittagong cattle (RCC) is a potential dual purpose cattle in Bangladesh however, due to the unsystematic breeding and lack of knowledge on rearing, the RCC is going to be extinct. The genetic improvement is the permanent and stable solution to increase the productivity and population number but it needs an objective breeding decision. The breeding objective requires calculation of economic values for all traits that have an impact upon profitability (James 1982). However, the economic evaluation studies are limited for dairy cattle in the tropics (Amer *et al.*1998) and in Bangladesh. Therefore, the present study was undertaken with objectives to (i) identify the present situation of RCC farming; (ii) estimates the costs, revenue and profit of individual cows; and (iii) calculate the economic values for different traits in the breeding objective.

Production, processing and marketing systems of RCC

The production, processing and marketing system involves the description of how RCC are bred, fed, managed and marketed their products. To know the current production, processing and marketing systems of RCC farm, 264 RCC's farm under 5 Upazilla of Chittagong district were studied from July 2008 to June 2009. The data were collected from a structured record sheet through fortnightly farm visit by the data collector. The collected data were analysed using PROC GLM of SAS (SAS 2000).

Economic evaluations of RCC

A deterministic model using RCCs was developed according to Van Arendonk (1985), Visscher *et al.*(1994) and Khan (2009). The model was developed in a linear programming context using Microsoft Excel. The main components such as nutrition, herd structure, feed purchase, milk production and sales, stock sales, labour and finances were incorporated in the model.

The economic analysis was done based on average values of marketable products (milk and meat) and the expenses incurred in dairy production. The profit (P) was derived as the difference between income (R) and costs (C).

The input parameters were derived from collected data of RCC of 5 Upazilla (Table 1). The milk production per lactation was considered as milk production per calving interval and was expressed milk yield (kg/year) as:

$$\text{Milk yield (kg/year)} = \frac{\text{Milk yield/lactation (kg)} \times 365}{\text{Calving interval}}$$

The total metabolisable energy (ME) requirement per year was the sum of ME requirement for maintenance, growth, pregnancy and production and was calculated as AFRC (1993). The dry matter (DM) requirements were calculated by the content of ME per kg DM. It was considered that cows were consuming roughage from grazing, paddy straw, tree leaves and 1–2 kg concentrate mix per day, to fulfill their energy requirements. The feed cost (roughage and concentrate mix) was calculated at 5.5 to 8.5 taka per kg DM. The revenue was derived from the differences of the sale of milk and beef, and cost feed and fixed costs (operational cost).

The individual cow income on per cow per year basis was estimated after running the base model, and the economic value (EV) of each trait, was obtained by re-running the base model after changing one unit.

Breeding, production and marketing systems of RCC

The farmers breed their RCCs with the semen of RCC bull supplied by the Central Cattle Breeding Station of Bangladesh and from a non-government organization, the Bangladesh Rural Advancement Committee (BRAC). Generally, all calves are fed colstrum during the first 3 to 5 days and then approximately 0.5 to 1.0 kg of whole-milk daily from 2 to 3 months. Thereafter, up to weaning they fed whole-milk with roughages, and little amount of concentrate. From weaning to age at first calving heifers are offered concentrate, roughages and are grazed on the road side, fallow land etc. During monsoon the cows are mainly fed with paddy straw and with a concentrate mix about 0.5–1.5 kg/day/cow.

Present address: [1]Professor, (e mail: [1]kkhan1567@yahoo.co.uk) [2]Assistant Professor, [4]Lecturer, Department of Genetics and Animal Breeding; [3]Professor, Department of Animal Science and Nutrition.

Table 1. The productive, reproductive and marketing variables in 5 Upazilla

Variables	Upazilla					Average
	Satkania	Chandanaish	Anwara	Potia	Raozan	
Birth weight (kg)	15	14	16	17	14	15
Mature live weight (kg)	162	171	177	166	190	173
Gestation period (d)	267	275	296	290	292	284
Milk yield / lactation (kg)	521	505	521	487	526	511
Lactation length (d)	270	255	263	227	217	246
Calving interval (d)	400	420	432	454	435	428
Milk yield (kg/year)	476	439	440	392	437	435
Calving rate (%)	0.91	0.87	0.84	0.80	0.84	0.85
Survivability (%)	96	93	94	93	90	93
Feed price/ kg DM (Tk)	5.5	5.9	6.3	7.1	8.5	6.7
Beef price/kg live wt (Tk)	110	110	110	110	110	110
Price /kg milk (Tk)	26	27	26	28	28	27

Legends: Tk, Taka (Bangladeshi currency).

Table 2. Costs, revenues and profit from different Upazilla's of RCC

Variables	Upazilla					Average
	Satkania	Chandanaish	Anwara	Potia	Raozan	
DM requirement						
Cow and heifer (kg)	1749	1800	1741	1686	1828	1761
Price (Tk)	9574	10048	10696	12498	15352	11625
Non-feed costs						
Milking cows (Tk)	750	750	780	790	670	748
Replacements heifer (Tk)	410	420	410	200	130	314
Total non-feed costs (Tk)	1160	1170	1190	990	800	1062
Total costs (Tk)	10734	11218	11886	13488	16152	12465
Revenue						
Milk revenue (Tk)	12229	11598	11130	10677	12086	11530
Beef revenue (Tk)	988	1042	1101	1043	1189	1049
Manure income (Tk)	548	548	548	548	548	548
Grand total	13764	13187	12779	12268	13822	13126
Income (Tk)	3031	1970	893	–1220	–2328	661
Net income, $	44	29	13	–17	–33	10

Legends: Tk, Taka (Bangladeshi currency) and 1US$ = 69.00 Tk.

The 1-year-old calves, culled cows and the surplus heifers are sold. The person who is not mainly engaged with earning for the family they usually take care the cows, and the farmers utilize their free time for cow's rearing.

Other management practices, such as vaccination and deworming are practised on most of the RCC farms. Cows give births at 4 year of age and were culled approximately 10 years of age. The farmer sale their milk direct to the market or sometimes to the middle man, who pool their milk and arrange the payment.

Costs, revenues and profit

The costs, revenue and profit of RCC farming on per cow per year basis are given in Table 2. The net annual incomes for RCC cows differed among the 5 Upazilla. The Satkania Upazilla has higher profit than others. The Raowzan and Potia Upazilla showed negative profit and other two Upazilla, Anowara and Chadanaish showed intermediate profit. These differences of profits of locations were due to the differences of milk production and also the feed price. The profitability of RCC was higher than indigenous cattle of Bangladesh (Khan *et al.* 2005).

Economic values (EVs) of different traits

The EVs for different traits on per cow per year under 5 Upazilla's of RCC are presented in Table 3.

Table 3. Economic values (US$ per unit) for different Upazilla's on a per cow basis

Variables	Upazilla					Average
	Satkania	Chandanaish	Anwara	Potia	Raozan	
Milk yield	0.38	0.39	0.37	0.39	0.40	0.39
Birth weight	0.009	0.011	0.011	0.01	0.012	0.009
Live weight	0.13	0.11	0.12	0.13	0.12	0.12
Calving interval	–0.45	–0.40	–0.37	–0.34	–0.40	–0.39
Calving rate	–0.20	–0.19	–0.18	–0.16	–0.18	–0.19

The EVs of milk yield was positive and varied among Upazilla's. The positive EVs for milk yield was attributed due to the current milk payment system, farmers' are paid on the basis of milk volume only. Similar results were reported by Kahi and Nitter (2004). However, negative EVs were reported by Groen (1989) and Veerkamp *et al.* (2002), but in their study farmers were paid on the basis of fat and protein yield and penalised for milk volume.

The EVs of calving interval and calving rate were negative and differed between Upazilla's. Veerkamp *et al.* (2002) observed the negative EVs for calving interval. Reducing calving interval improves farm profit because negative value indicated due to higher milk yield. Higher calving rate increased the number of 1-year-old calves in the herd. These calves contribute beef income rather than milk income because only 3 to 4 year-old cow produce milk. However, these calves feeding and management costs was added in expenditure and the beef income was lowest than the cost which leads to negative EVs for calving rate.

The EV for mature live weight and birth weight of RCC under different Upazilla's showed positive and were similar. But due to the lower values it has very low impact on profitability and the EVs of live weight differed with the results of Visscher *et al.* (1994) and Lopez-Villalobos and Garrick (2002) as they calculated the negative EV for live weight.

SUMMARY

The study was conducted to determine the costs, benefits, revenues and estimates the economic values for different traits of RCC under 5 Upazilla of Chittagong district of Bangladesh. Total annual profit of the herd was derived from the difference between costs and revenues using a deterministic model. The average annual profit per RCC was US$10. The RCC of Satkania Upazilla showed the highest profit (US$44) whereas Rowzan Upazilla showed the lowest profit (negative). The EVs of milk yield, calving interval and calving rate were differed with locations however, the EVs of birth weight and mature live weight were similar.

REFERENCES

AFRC (The Agricultural Food Research Council). 1993. *Energy and Protein Requirements of Ruminants*. An Advisory Manual Prepared by the AFRC Technical Committee on Response to Nutrients. CAB International Wallingford, United Kingdom.

Amer P R, Mpofu N and Bondoc O. 1998. Defining of breeding objectives for sustainable production systems. *Proceedings of the 6*th *World Congress on Genetics Applied to the Livestock Production* **28**: 97–103.

Groen A F. 1989. Economic values in cattle breeding. 1. Influence of production circumstances in situations without output limitations. *Livestock Production Science* **22** (1): 1–16.

James J W. 1982.Construction, uses and problems of multi-trait selection. *Proceedings of the 2*nd *World Congress on Genetics Applied to the Livestock Production*.pp.130–39. Madrid, Spain.

Kahi A K and Nitter G. 2004. Developing breeding scheme for pasture based dairy production system in Kenya. I. Derivation of economic values using profit function. *Livestock Production Science* **88** (1–2): 161–77.

Khan M K I. 2009. 'Development of models for genetic improvement of dairy cattle under cooperative dairying conditions in Bangladesh.' Ph.D. thesis, Institute of Veterinary, Animal and Biomedical Sciences, Massey University, New Zealand.

Khan M K I, Blair H T, Lopez-Villalobs N and Johnson P L. 2005. Productive, reproductive and economic performance of dairy cattle in Bangladesh. *Proceedings of the Association for the Advancement of Animal Breeding and Genetics* **16**: 124–27.

Lopez-Villalobos N and Garrick D J. 2002. Economic heterosis and breed complementarity for dairy cattle in New Zealand. *Proceedings of the 7*th *World Congress on Genetics Applied to the Livestock Production Pp 22*, France.

SAS® 2002. *User's Guide. Statistics.* 8th edn. Cary (NC): SAS Institute Inc., 2000.

Van Arendonk J A M. 1985. A model to estimate the performance, revenues and costs of dairy cows under different production and price situations. *Agricultural Systems* **16** (3): 157–89.

Veerkamp R F, Dillon P, Kelly E, Cromie A R and Groen A F. 2002. Dairy cattle breeding objectives combining yield survival and calving interval for pasture-based systems in Ireland under different milk quota scenarios. *Livestock Production Science* **76** (1–2): 137–51.

Visscher P M, Bowman P J and Goddard M E. 1994. Breeding objectives for pasture based dairy production systems. *Livestock Production Science* **40** (2): 123–37.