

STUDY ON THE PRODUCTIVE AND REPRODUCTIVE PERFORMANCE OF RABBIT AND THE ECONOMICS OF RABBIT FARMING

M. Hasanuzzaman¹, K. B. Amin¹, M. Ahaduzzaman, M. Alam²

¹Department of Animal Science & Nutrition, ²Department of Medicine and Surgery, Chittagong Veterinary and animal Sciences University, Khulshi- 4225, Chittagong, Bangladesh.

A study was conducted to know the growth and reproductive performance of rabbit as well as to assess the cost of rabbit rearing. The study carried out in the Rabbitry Unit of the department of Animal science and Animal Nutrition, CVASU. For this study 12 adult rabbit were selected and fed concentrate mixture containing 2369 Kcal/kg energy and 16.44 % CP and green grasses. All the experimental animals were tried to keep in same management system for the entire period. From this experiment it was observed that the total average dry matter intake of male and female was similar as 119.5 ± 5.05 g per day. It was also observed that the daily average body weight gain was lower (13.33 ± 0.07) in female and higher (14.44 ± 0.09 g) in male rabbits, respectively. The reproductive performance in the study includes percent of does kidded, gestation period, litter size, litter weight at birth, average individual kit weight at birth and kit mortality and those were 100%, 31 ± 0.3 days, 3.4 ± 0.45 nos., 240 ± 15.25 g, 70.59 ± 3.3 g and 10.5% respectively. The daily average feed cost for each animal was found as 3.39 Taka. Finally, total profit from rearing of 12 adult rabbits was 7030.6 taka for three months. From this discussion, it can be summarized that, rabbit have great potentiality in growth and reproduction. Rabbit can be reared in least cost and it's a profitable species. As rabbit farming is easily manageable and sustainable it has a bright future potential in our country as a source of income generation as well as a source of animal protein.

Key Words: Rabbit, production, reproduction, animal protein, income

Among the countries of Southeast Asia, Bangladesh has a huge potential for

development. But various socio-economic reasons hinder its development. About half of the country's populations live below the poverty line with 80% in the rural areas (Mishra and Hossain 2005). Acute crisis of human food particularly animal protein is the major problem of Bangladesh. Here, meat produced by different conventional sources like poultry, cattle, sheep and goat is quite insufficient to meet-up the growing demand of animal protein in spite of high density of livestock due to proper planning. Protein deficiency has been taken as the major contributory factor in malnutrition. Per capita consumption of animal protein in Bangladesh is only 4.57 kg per year whereas the standard requirement is 43.8 kg per year (Begum, 2005).

It is therefore, important to explore some alternative sources of animal protein to minimize the deficiency of protein. So, small herbivorous and unconventional species of livestock like "rabbit" would be an integral part of the agricultural farming system that plays a crucial role in nutrition, generation of income and self-employment in Bangladesh (BBS 1998). Rabbit is an important micro livestock may be considered as a promising and potential alternative source of protein in this regard. Rabbit has high demand in Japan, Australia, United Kingdom, USA, Mexico, Russia, France, Spain and some Middle Eastern countries for its value in the context of meat/flesh, fur/wool, and wide use as model animal for different laboratory works. But farming of rabbit as a means of alternative nutritious diet and source of rural family income has not been yet made popular in Bangladesh (Hassan et al. 2012).

The socio economic background of our country demands innovative approaches for alleviating rural poverty and it can be done

to a greater extent by involving the rural families income generating activities. Rabbit mostly fed upon green forage has the potential of improving family consumption of protein diet of many of the poor rural families while at the same time helping them in uplifting their family income through farming. There is an increase interest in the diversification of animal production system in Bangladesh to produce product which are not surplus nationally. Rabbits are of shorter gestation period, early sexual maturity and has the ability to rebreed shortly after kindling (Hassan *et al.* 2012). These qualities confer on rabbits a potential to bridge the shortage of animal protein in developing countries, where grain can only be justified for human use (Irlbeck 2001). In addition, rabbits require small amounts of feed and use inexpensive, easily constructed housing (Begense 2008). Furthermore, rabbits do not compete with humans for grains as strongly as chickens (Moreki 2007, Van Dijk 2003). Rabbits compliment well with vegetable production as garden wastes are fed to rabbits, whereas the manure is used to fertilize the soil. The climatic condition, commercial factors, legal environment, religious and social practices and technological aspects support the rabbit raising potential in Bangladesh (MIDAS 1992).

A lot of works have been done regarding the rabbit rearing but very less work has been covered regarding the potentiality of rabbit farming as a meat animal. Depending upon this statement current case study was under taken to explore the prospect of rabbit farming in Bangladesh.

MATERIALS AND METHODS

The details of the study approach and methodology for study presented in this chapter.

Study area and study Period

The study was carried out at the Rabbitry unit under the Department of Animal Science & Nutrition, Chittagong Veterinary and Animal Sciences University, Chittagong over a period from October to December 2013 to observe the growth and reproductive performance of Crossbred New-Zealand

White (NZW) rabbit as well as to assess the economics of rearing of them.

Source of Experimental Animal

A total of 12 adult Cross-bred NZW rabbit aged about 6 months (10 does & 2 male) were collected from local market of Chittagong, Bangladesh and reared in a steel made cage individually at the Rabbitry unit of CVASU.

Formulation of Ration

After analysis of the proximate component of the individual feed ingredients ration was formulated for the experimental animal. Formulated ration for experimental animals are shown in the table 1.

Management Practices

Preparatory management: Before starting of the experiment, the animals were kept for 1 week to adopt with the available feeds and environment. Coproscopy was done to find out any parasitic infestation. All the animals were treated with broad spectrum anthelmintic drug (Albendazole, 10mg/kg body weight) to make them free from any kind of internal parasite.

Housing and Sanitation: All the rabbits were housed in all-steel made cage individually in a well ventilated place, measuring 1.95m×1.3m×2.1m in dimension. A nest box was placed before 3-4 days of parturition, which provided natural light and ventilation. Each cage was about 43cm × 20cm ×62cm in dimension. A rectangular metal feeder and a waterer were provided in each cage. Cages and floor of the room were cleaned with antiseptic in every morning and evening. All of the equipment likes feeders, waterer etc. was also cleaned regularly in the morning and the waste materials and the refusal feeds were disposed properly.

Feeding management: The formulated concentrate mixture (Table 1) along with *ad-libitum* green grasses were provided to the experimental animal. The locally available green grasses were collected in every morning, cleaned, chopped, weighed and then supplied adequately to the animal. The required quantity of concentrate feed (70-100 gm) was supplied in the morning at 9.00AM and then in the evening at 4.00 PM. Clean, fresh water was made available to rabbits all the time. In the following day

Table 1: Chemical composition of rabbit ration (concentrate mixture)

| Ingredients | Fresh amount (Kg) | DM (Kg) | ME (kcal) | CP (kg) | CF (kg) | EE (kg) | Ash (kg) |
|--------------|-------------------|-----------|--------------|-----------|-----------|----------|-----------|
| Maize | 29.85 | 25.43 | 98773.65 | 2.35 | 0.716 | 0.776 | 2.08 |
| Wheat bran | 14.93 | 13.28 | 16199.05 | 1.64 | 1.82 | 0.567 | 0.812 |
| Rice polish | 14.93 | 14.53 | 44595.91 | 1.77 | 1.851 | 1.896 | 1.209 |
| Broken rice | 9.95 | 8.73 | 21890 | 0.70 | 0.27 | 0.099 | 0.106 |
| Pea bran | 9.95 | 9.09 | 10746 | 1.13 | 0.63 | 0.189 | 0.368 |
| Soybean meal | 19.90 | 17.71 | 44576 | 8.85 | 1.94 | 0.577 | 1.38 |
| Salt | 0.5 | 0.49 | - | - | - | - | - |
| Total | 100 | 89.26 (%) | 2368 kcal/kg | 16.44 (%) | 6.019 (%) | 4.10 (%) | 5.955 (%) |

feed refusal was collected, weighed and recorded.

Breeding management

Mating of the animal: After 15 days of starting experiment, does were transferred to buck cages for mating and kept them for 2 hours and returned to their own cage after successful mating. After 2 days, all the rabbits were allowed for mating again for confirmation of pregnancy and the date, buck number were recorded.

Maternity care: Does required special care to their diet to ensure that they are getting adequate nutrition during pregnancy; a doe with nutritional deficiencies may abort or reabsorb the fetuses. Due to her carrying more weight, extra nutrition to her eating habits was provided in her ration. At the last few days of pregnancy extra energy cut out and adequate water supply continued. Adequate fresh and clean water was provided. Careful observation of each pregnant doe was done to find out any problem and to check health status throughout the pregnancy period. A nest box was set in the cage with adequate cotton as bedding materials before 3-4 days of the parturition.

Caring of newborn kit: After each birth special care was taken for the new born kitten. Close observation was done to find any neonatal problem. Nest box was filled with adequate cotton to prevent new natal injury.

Parameters recorded

Feed intake: A measured concentrate mixtures was supplied to the animal in each cage in the morning and green grasses were given *ad-libitum*. The refusals of the subsequent days were collected, weighed and recorded in the following morning before feeding. The daily feed intake (green grass and concentrate) was calculated by subtracting the refusals from the supplied diet.

Live Weight: Rabbit were weighed individually by using a weighing balance on two consecutive days at the beginning of the experiment and the average was recorded as the initial live weight and thereafter at the end of every week before morning feeding. The weight change was calculated by subtracting the initial live weight from final live weight.

Daily average live weight gain: Average daily weight gains for the different periods were separately recorded and calculated as follows:

Average Daily Gain (ADG) = (Final live weight-Initial live weight)

Feed Conversion Ratio: Feed conversion ratio was measured through dividing daily dry matter intake by daily body weight gain as follows:

Feed Conversion Ratio (FCR) = DM intake / Daily average gain

Reproductive Performance: To study the reproductive performances of the experimental rabbit the following parameters were recorded.

- i. Per cent of does kidded
- ii. Gestation period

- iii. Total No. of kit born
- iv. Litter size at birth
- v. Individual kit weight at birth
- vi. Litter weight at birth

Mortality: Kit mortality also keep counted into account during experimental period. Post mortem examination was also done after each death of rabbit.

Cost assessment: Cost of offered feed per kg was calculated on the basis of the cost of individual feed ingredients. Total feed cost of individual rabbit as well as cost of feed offered to animal per day feed was calculated to know the economics of rabbit farming. Price of the feed ingredients was collected from local market while purchased.

Profit determination: Profit was determined through deduction of total cost from total return by the following formula:

$$\text{Profit} = \text{Total return} - \text{total cost of rearing}$$

Total investment include buying cost of adult rabbit, feeding cost, labor cost, electricity cost, housing cost etc. although labor cost, housing cost and electricity cost was not included in this calculation. Total return was counted by aggregation of selling of adult and young rabbits.

Statistical Analysis: The data were put on the master sheet in Microsoft Office Excel 2007 and were arranged in tabular form. The obtained data imported to software STATA/IC-11.0 for analysis. The comparisons of variables with different categories were done by chi-square test.

RESULTS AND DISCUSSION

Growth Performance

Table 2: Growth performance of rabbit does and bucks

| Parameter* | Female (Mean±SE) | Male (Mean±SE) | Sig. level |
|-------------------------------------|---------------------|-------------------|------------|
| Initial live weight (kg) | 1.25±0.08 | 1.57±0.1 | NS |
| Final live weight (kg) | 2.45±0.16 | 2.87±0.2 | NS |
| Total live weight gain (g) | 1200±110 | 1230±100 | NS |
| Weekly average live weight gain (g) | 93.31±0.12 | 101.08±0.15 | NS |
| Daily average live weight gain (g) | 13.33±0.07 | 14.44±0.09 | NS |
| Daily feed intake (g) | 100±10 | 100±10 | NS |
| DM intake (g/d) | | | |
| Green grass | 30.5±1.5 | 30.5±1.5 | |
| Concentrate | 89.0±4.35 | 89.0±4.35 | |
| Total | 119.5±5.05 | 119.5±5.05 | |

*Parameter indicates the mean of 10 female rabbit and 2 male rabbit; *NS=Not significant.

The feed intake and average daily gain of rabbits were calculated and the data is shown in Table 2.

Live weight

From the table 2 it was found that the total live weight gain during the 90 days experimental period of female rabbit was 1200±110 g and that of the male rabbit was 1230±100 g. Similarly daily live weight gain of rabbit does increase at the rate of 13.33 ±0.07 g and in male rabbit it was 14.44±0.09 g. The findings of the experiment is closely related with Ezema and Eze (2010) who found average daily live weight gain of rabbit was 7-10 gm/day. However, this result does not support the observation of Sagheer and Hassanein (2014) who found growth rate 32g/day. The weekly live weight of rabbit does increased up to whole study period at the rate of 93.31±0.12 gm/week and in male rabbit at the rate of 101.08±0.15 gm/week.

Dry matter intake

The level of energy were 2367 kcal/kg feed in diet of experimental animal. The average dry matter intake from green grass was 30 ± 1.5g/day both in male and female. The dry matter intake from concentrate was 89 g/day which is similar in male and female. The total dry matter intake was 119.5±5.05 g/day with is nearly similar to the findings of Ramchurn and Ragoo (2000), they mentioned 104± 11.3 g/day DM intake of rabbit.

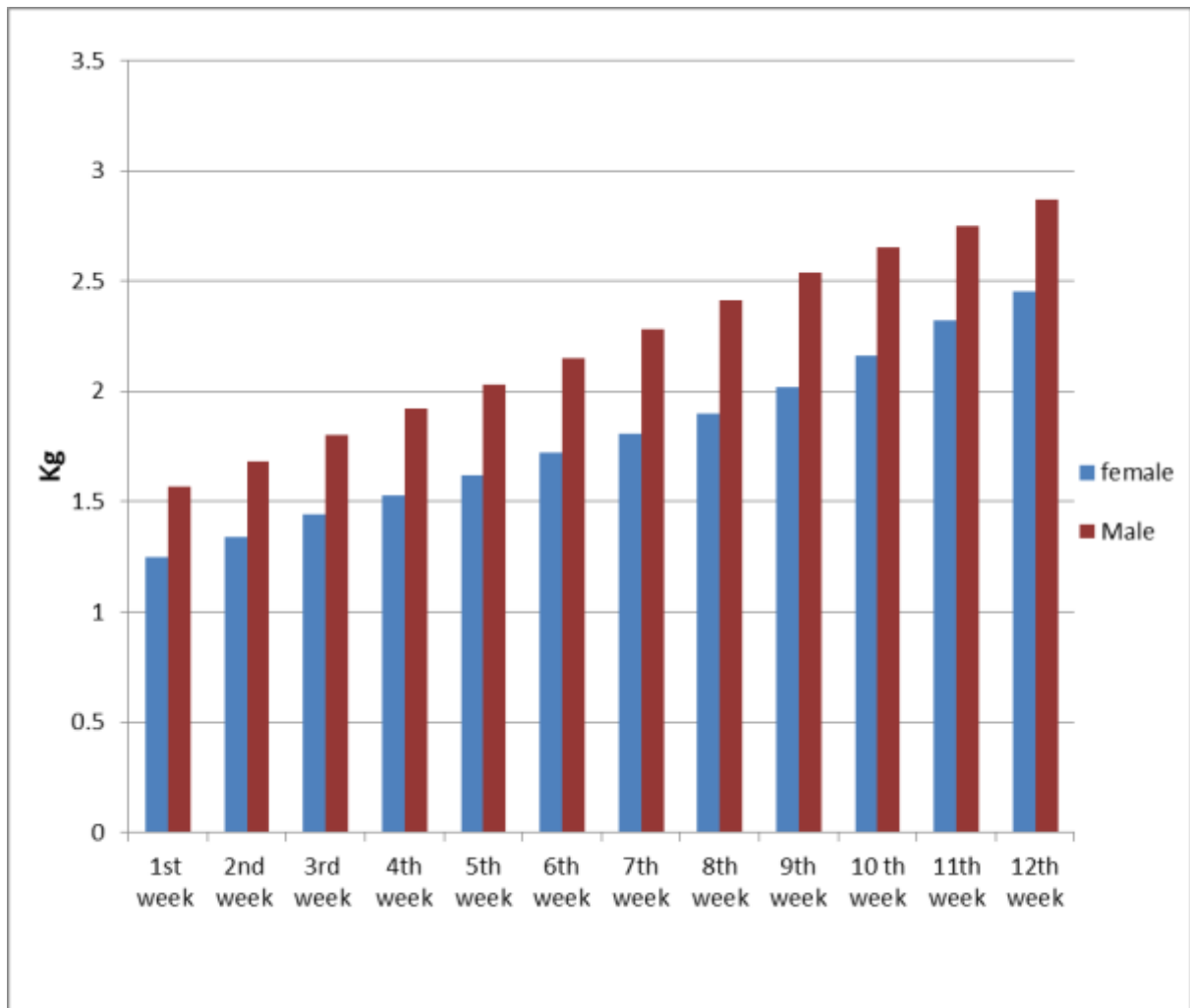


Figure- 1: Cumulative body weight gain (kg) of rabbit

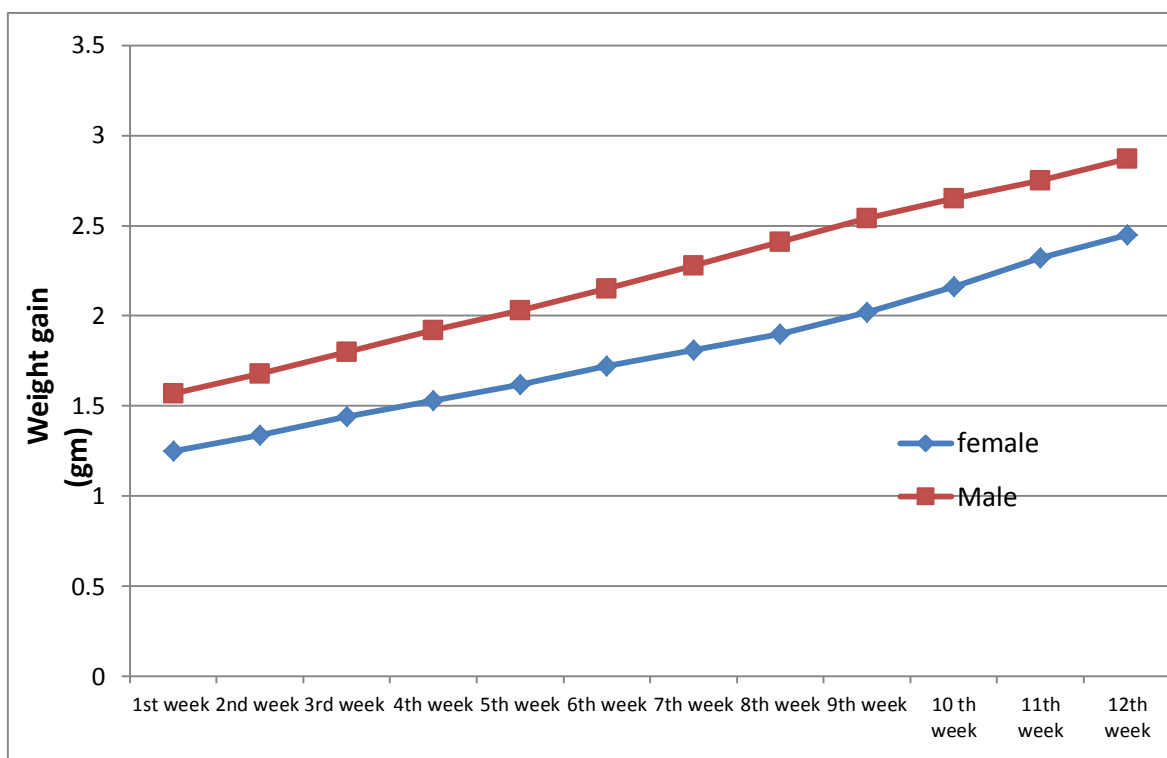


Figure- 2: Average body weight gain (gm/week) of rabbit

Reproductive performance of does

The Table 3 represents the reproductive performance of rabbit does and kit performance.

Table 3: Reproductive performance of rabbit does and kit performance.

| Parameter* | Values (Mean±SE) |
|---|---------------------|
| % of does kidded | 100 |
| Gestation period (days) | 31 ±0.30 |
| Total no. of kit born (for 2 breeding) | 68±0.05 |
| Litter size at birth | 3.4±0.45 |
| Litter weight at birth (g) | 240±15.25 |
| Individual kit weight at birth (g) | 70.59±3.3 |
| Kit mortality (%) | 10.5 |

*parameter indicates the mean of ten (10) rabbit does.

From the table 3, it was found that percent of does kidded was 100% and all does of study gave birth within expected time of parturition. The average gestation periods of study animal were 31±0.30 days. The gestation period of rabbit is in close agreement with those reported by Yono *et al.* (1986) of 31-32 days. The litter size at birth, litter weight at birth and individual kit weight at birth were 3.4±0.45, 240±15.25 g and 70.59±3.3 g respectively. Litter size at birth mostly depends upon the ovulation rate. In this study kit mortality were found 10.5% which might be due to environmental stress as the experimental period was during mid winter. Rodel *et al.* (2009) recorded 42.2% kit mortality in rabbits fed diet

containing 2700 kcal/kg. Total number of kit was 68 at the end of the study.

Cost of Production

Table 4 shows the price of individual ingredients and calculated value of price per kg of feed.

Total no. of animal = 12

Total amount of feed offered per day = 12×100=1200 g

Total cost of feed per day = 33.58×1.2=40.3Taka (33.58Taka/kg feed)

Cost of feed per day per animal =40.3/12=3.36 Taka (40.3 Taka for 12 animals)

Total cost of feed for 90 days period for individual animal =3.36×90= 302.4 Taka/animal

Total cost of feed during experimental period = 40.3 ×90 =3627 Taka (Tk.)

Feed cost for kit:

Total No. of kit =68

Average feed consumption per day=25 g

Cost of feed per a day per animal=0.025×33.58=0.84 Taka (1 kg feed =33.58 Taka)

Total cost of feed per day=0.84×68=57.12 Taka

Total cost of feeds for 30 days=57.12×30=1713 Taka (considering one month feed cost for kits

Result revealed that cost of feed per kg, total cost of feed, cost of feed per animal per day and total cost of feed per animal were 33.58 taka, 3627 taka, 3.36 taka and 302.4 taka, respectively.

Profit

Table 4: Calculation of feed cost

| Ingredients | Amount used (per 100kg) | Market price(Taka/Kg) | Total cost of individual ingredients (Taka) | Total cost per kg feed (Taka) |
|--------------|----------------------------|--------------------------|---|-------------------------------------|
| Maize | 29.85 | 30 | 895.50 | 33.58 |
| Wheat bran | 14.93 | 30 | 447.90 | |
| Rice polish | 14.93 | 23 | 343.39 | |
| Broken rice | 9.95 | 32 | 318.40 | |
| Pea bran | 9.95 | 35 | 348.25 | |
| Soybean meal | 19.90 | 50 | 995.00 | |
| Salt | 0.5 | 20 | 10.00 | |
| Total | 100 | - | 3358.44 | |

Table 6: Expenditure, return and profit of rabbit farming

| Expenditure | Items | Units | Price per Unit (Tk.) | Total (Tk.) | Total Profit (Total return- Total expenditure) (Tk.) | Profit per month (Total profit÷3) (Tk.) |
|---------------------|----------------------------|-------|----------------------|-------------|--|---|
| | Purchasing of adult rabbit | 12 | 300 | 3600 | | |
| Feed cost for adult | 108 kg | 33.58 | 3627 | | | |
| Feed cost for young | 51 kg | 33.58 | 1713 | | | |
| Total expenditure | | | | 8940 | | |
| Return | Selling of adult male | 2 | 400 | | 16000 | |
| | Selling of adult female | 10 | 500 | 5000 | | |
| | Selling of young | 68 | 150 | 10200 | | |
| Total return | | | | 16000 | | |

Usually the profit of a farm is being determined on the basis of the investment (different cost) and returns. Here only the feed cost is used to determine the profit assuming that the farmer might have its own house where they are living thus the labor and other overhead cost have also been excluded from the calculation.

From the table-6, it is found that the total profit from the experimental animals for the whole tenure was 7060/- BDT (1 US \$ is parallel to 80 BDT). So the profit may be said as 2353/- BDT per month which is supported by Begense (2008).

CONCLUSION

From this study it can be concluded that, rabbit have great potentiality in growth and reproductive performance. Although rabbit farming has not yet gained popularity among the common people of Bangladesh, the rural people of our country can be involved in rabbit farming for changing their socio-economic status. As rabbit farming is easily manageable and sustainable it has a bright future potential in our country as a source of income generation as well as a source of animal protein. Therefore, the livestock departments of Government should necessary steps to trainee up and motivate the farmers and provide incentives to them for the promotion rabbit rearing and developing it as an industry.

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