Chapter 6

GENERAL DISCUSSION

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Interest in research and development of hair sheep in the humid tropics of Asia is relatively a recent phenomenon when compared to the widespread breeding and commercial use of hair sheep in South America and certain parts of Africa. Although in India some hair sheep breeds are sparsely distributed, in other parts of South Asia and Southeast Asia mutton production involves woolly sheep only. In Indonesia and Malaysia, the importance of the hair sheep breeds was realized only in late 1980's. Winrock International, a research agency in Arkansas, USA, in collaboration with US Aid, developed a hair sheep breeding programme and crossbreeding of hair sheep with woolly in Sumatra, Indonesia. Concurrently in Malaysia, the Malaysian Agricultural Research and Development (MARDI) developed a breeding programme with imported Bali-Bali for performance testing in Malaysia. Initial results from these experiments encouraged many other organizations in Malaysia to embark on hair sheep breeding programmes with smaller numbers of nucleus herd animals.

In the University of Malaya's research farm, a joint programme funded by the European Commission was established to look into the breeding of hair sheep and its crosses with local sheep. The participants of the programme were the Technical University of Berlin, Germany, University of Malaya, Kuala Lumpur, Malaysia, University of Florence, Italy, and the Institute of Tropical Medicine, Antwerp, Belgium. The main objective of this project was to develop a breeding programme involving the Cameroon hair sheep and the local Thai Long Tail sheep. However, the nutritional requirements of the purebred and crossbred sheep, and the disease resistance and immunity status of the local sheep compared to the imported hair sheep and the crossbreds were also studied in this programme. The study reported in this thesis is limited to the growth, body conformation and reproductive performance of the various breeding groups.

Generally, the study had produced purebreds Cameroon hair sheep, Thai Long Tail wool sheep and their F_1 (Cameroon (C) x Thai Long Tail (TLT)), F_2 (F_1 x F_1), F_3 (F_2 x F_2), BC_1 (F_1 male x TLT female) and BC_2 (TLT male x F_1 female) crossbreds in the University of Malaya's nucleus herd, bred under an intensive management system.

The Cameroon hair sheep or the semen from Cameroon males imported for the study was from an experimental station in Berlin where the stock had been kept in small numbers mainly for research purposes. It was not the objective of this centre to breed hair sheep for better performance. Therefore, the initial stock that came to Malaysia had poorer growth rate than the local Thai Long Tail. The Cameroon sheep also experienced longer lambing interval, which was also due to a very late post-partum oestrus. However, they had compact body size, which may lead us to think that they have shorter bones and perhaps the meat: bone ratio in the Cameroon would be better. This theory could only be proven when one undertakes research to look into the various carcass characters of the Cameroon, Thai Long Tail and the various other crossbred genotypes produced during the project.

Heterosis based on the performance of the F_1 sheep minus the mid-parent mean for growth traits generally indicated positive heterosis. The F_3 and BC_2 animals also had similar trends while the F_2 and BC_1 animals had lower birth weight and slightly lower growth rate at different stages of growth until 270 days. A preliminary analysis of individual and maternal heterosis involving the data of three filial generations and two backcrosses (not presented here due to the very small numbers in some of the above groups) indicated substantial maternal heterosis and maternal effect. However, to conclusively prove this, further studies on this aspect using larger numbers of animals would be required. The lower birth weight and subsequent body weights in the F_2 and BC_1 lambs could probably be due to selection of F_1 hairy parents when matings were done to produce F_2 animals from crosses of F_1 males and females.

The effect of genotype was significant for birth weight ($P \leq 0.05$) but became not significant for weaning weights and weights at 180, 270 and 360 days. There were significant interaction effects between genotype and the type of birth and between genotype and sex showing the superiority of the single born lambs to the twins and the males over the females at the age of 90, 180, 270 and 360 days. However, there was some inconsistencies in the performance of lambs from the three parity groups. In some traits the first parity lambs performed better than parity two and parity three lambs and vice versa but in some cases the weights of the third parity or the higher parity lambs seemed to be the highest. The effect of the parity of birth was not significant for most of the growth, body conformation and reproductive traits.

The effects of sex and the type of birth were also significant for the daily weight gain at the earlier part of the growth period (birth – 90 days and 90 – 180 days) only. In other age groups the main effects of genotype, sex and type of birth were not significant. The interaction effects between genotype and sex, and genotype and type of birth could be observed for the daily weight gain between the birth to 180 days. After 180 days the males, females, single born and twins from the various genotypes gain weight consistently and were not significantly different from one another. In most cases, the backcross lambs gained more than the other genotypes and this was reflected in the growth performance where they had higher body weights than the other crossbreds as well as the Thai Long Tail. The weight gains of the three filial generations were almost similar and in most cases their gains were higher than those of the Thai Long Tail. This could be attributed to higher meat production because by having no wool or less wool the feed consumed could be converted more to meat production rather than to wool.

The advantage of having no wool or less wool was shown by the study on their body conformation traits. The effect of genotype became very highly significant on the measurements of the height at wither, body length, heart girth and back girth at the age

of 90, 180, 270 and 360 days. A significant effect of sex was observed for the height at wither only and at the age of 90, 180 and 270 days. Although the Thai Long Tail was bigger or heavier than the crossbreds, their body measurements were almost similar. This could reflect the body compactness of the crossbreds especially the F_1, F_2 and F_3 which had no wool or very little wool on their bodies. The crossbreds showed improvement in their body weights when compared to the Cameroon and at a size similar to or slightly bigger than the Thai long Tail they were generally heavier especially at the latter ages. Further studies should look into a comparison between the carcass traits of the purebred Cameroon and Thai Long Tail as well as their crossbreds. Similar studies could also be conducted on other hair sheep and wool sheep breeds and their crosses.

The reproductive performance of the F_1 and F_2 crossbreds was intermediate between the two parental ewes. The purebred Cameroon showed early maturity but the long post-partum oestrus made it difficult to produce more purebred Cameroon offsprings during this seven-year study period. The significant effect of genotype could be observed in most of the reproductive traits studied. Generally the F_1 and the F_2 crossbreds showed better reproductive performances than the Thai Long Tail but the latter showed the shortest length of the first and the second post-partum oestrus. Their gestation period was between the range of 148 –152 days and their good mothering ability was reflected by the very low lamb mortality. Further studies can look into other reproductive performances such as the effect of age and the weight of ewes at parturition on the growth performances of their offsprings.

Studies on the heritability estimates of each body weight trait and the genetic/phenotypic correlations between body weight traits indicated intermediate heritability estimates showing that selection for growth in the animals would result in genetic gain for growth, provided that large numbers of animals were involved in the

breeding programme. Therefore, the initial aim of the study would be to multiply the animals to attain a large number before concrete selection programmes could be undertaken. The higher positive phenotypic correlations and the lower genetic correlations between traits found in this study could also be further investigated with larger numbers of sheep than in this study. In order to have reliable genetic estimates, many authors in the past had proposed at least 100 males, 1000 females and 10,000 offsprings in any practical study involving variance-covariance analysis and at least 1000 parent-offspring data for regression analysis. It is not easy to obtain these numbers in a breeding study at the University experimental farm. In Malaysia, it is therefore essential to combine the resources of the various animal research and development agencies to develop a common goal for breeding strategies and objectives. The selection criteria for the improvement of the hair sheep crossbreds could also be developed once the breeding objectives and strategies are properly defined.

Overall, the results have shown that in general, the hair sheep crossbreds were better than the wool sheep and in most cases better than their hairy parents in the growth, body conformation and reproductive traits. These crossbreds are therefore suitable for the improvement of the sheep industry in the country and can be distributed to farmers for commercialization. Today, the Department of Veterinary Services (DVS) and the Malaysian government has made several efforts to import other hair sheep breeds such as the Barbados Blackbelly and Santa Ines into the country and breed them locally in DVS farms. Some of the hair sheep crossbreds, including the Cameroon crossbreds, had already been distributed to farmers and their performances evaluated. This study can further enhance and give better information on the breeding, growth and reproductive performances of the hair sheep crosses.

In many of the sheep breeding experiments in the humid tropics of Asia, comparisons among genotypes were restricted to growth and reproductive traits only.

This study is no exception to that. There are almost no studies reported on the biological efficiency or eve feed efficiency of the wool sheep or hair sheep. Since feed cost in any animal production or breeding programme is the major cost, it is recommended that future researchers in hair sheep or even wool sheep programmes place importance on the feed intake data in order to estimate feed efficiency.

Economic analysis of hair sheep breeding programmes is also important. This incorporates studies of growth, feed efficiency, rate of reproduction and carcass quality in hair sheep. Fleece weight and wool quality may not be important in hair sheep production but in experimental studies it may be useful as it gives an idea of how much feed has been utilized for the production of unwanted fleece or wool.