Chapter 7

SUMMARY

AND

CONCLUSION

7. SUMMARY AND CONCLUSION

Studies on the genetic and phenotypic estimates of growth and reproductive traits of Thai Long Tail and its crosses with Cameroon hair sheep were conducted at the University of Malaya's farm for a period between 1990 to 1997. Various genotypes including the purebred Cameroon hair sheep that were produced in the farm, purebred local Thai Long Tail wool sheep, their F_1, F_2, F_3, BC_1 and BC_2 crossbreds were involved in the evaluation of the various traits. All the animals were bred under an intensive management system.

The traits involved in the studies are the growth performance, body conformation traits, reproductive traits and estimates of the genetic and phenotypic parameters of certain body weight traits. The growth data were evaluated by the effects of genotypes, sex, type of birth and parity of birth on their weights at birth, 90, 180, 270 and 360 days of age. The body conformation traits were evaluated by taking measurements for the height at wither, body length, heart girth and back girth when the animals were at 90, 180, 270 and 360 days of age. A spring balance and tape measurement was used in taking the body weights and the body measurements. The estimates for the genetic and the phenotypic parameters were calculated by using a computer software while the other data were analysed by using the SAS statistical package.

The least square analysis of variance for the growth performance showed that the effects of the year of birth and sex were significant for birth weight, 90, 180, 270 and 360-days body weights. The effect of the type of birth was very highly significant at the birth, 90 and 180-days weights but become less significant at the 270-days weight and not significant at the 360-days weight. The effects of genotypes and the parity of birth were only significant at birth. Significant effects were also obtained for the

interaction between genotypes and sex at 180, 270 and 360 days while the interaction effect between genotypes and the type of birth was significant at 90, 180, 270 and 360 days.

Throughout the growth period, the least square means showed that the males and the single born lambs were significantly ($P \leq 0.05$) superior than the females and their twin counterparts in terms of body weight development. At birth the males and the single born lambs had the weights of 2.76 ± 0.04 kg and 2.96 ± 0.03 kg respectively and increased to 27.81 ± 0.41 kg and 27.56 ± 0.30 kg respectively at 360 days of age. The females and the twins had the birth weights of 2.61 ± 0.04 and 2.41 ± 0.05 kg and 360-days weights of 26.35 ± 0.41 kg and 26.60 ± 0.48 kg respectively. The effect of the parity of birth was very inconsistent whereby the parity 2 lambs were superior only at birth, parity 1 at weaning while parity 3 lambs were superior than the two parity groups at 180, 270 and 360 days. A significant difference ($P \leq 0.05$) for the effect of parity was found for the birth weight only.

The effect of genotype was significant for birth weight only. The purebred Cameroon remained as the lightest at birth and throughout the growth period while the F_1, F_2 and F_3 lambs were found to have weights heavier than the Cameroon and the intermediates between the two parents at birth and 90 days. From the age of 180 days onwards it could be observed that the F_1 lambs had higher body weights than the Thai Long Tail. The F_1 was superior than the F_2 and F_3 but the F_1 and the F_2 had greater body weights than the Thai Long Tail at the age of 270 and 360 days, while the F_3 was heavier than the Thai Long Tail at 360 days. The BC_1 was heavier than the BC_2 at birth only. At 90, 180, 270 and 360 days the BC_2 lambs had higher body weights than the BC_1. It was also found that at 180, 270 and 360 days the BC_2 lambs were also heavier than all the other genotypes. The partial hair gene effect and the maternal gene effect could be attributed to these.

The least square analysis of variance for the average daily weight gain (ADG), showed significant differences for the effects of the year of birth from birth - 90 days ($P \leq 0.001$) and 90 –180 days ($P \leq 0.001$), sex from birth – 90 days ($P \leq 0.01$), type of birth from birth – 90 days ($P \leq 0.001$) and 90 – 180 days ($P \leq 0.05$), parity of birth at the age of 90 – 180 days ($P \leq 0.001$), the interaction effect of genotype and year of birth at 90 – 180 days ($P \leq 0.01$) and 180 – 270 days ($P \leq 0.05$), interaction effect between genotype and sex at the age of 90 – 180 days ($P \leq 0.01$) and the interaction effect between genotype and type of birth from birth – 90 days ($P \leq 0.01$).

In most cases, the effect of the average daily weight gain was very highly significant from birth to 90 days between the sexes and the type of birth but non-significant for the effects of genotype and parity of birth (except from 90 – 180 days). A comparison of the least square means for the interaction effect between genotype and sex and the interaction effect between genotype and type of birth are presented in the results. Generally, the weight gains decreased from birth to 360 days of age and the crossbreds gained more than either or both their parental ADG during the periods from birth – 90 days, 90 – 180, 180 –270 and 270 – 360 days. The F_1 lambs gained the most during the pre-weaning period from birth – 90 days while the BC_2 lambs gained the most from weaning to 180 days of age. At a later age from 270 – 360 days the F_3 lambs were found to have the highest daily weight gain while the Thai Long Tail had the lowest. A comparison between the sexes showed that except for the age between 90 – 180 days the males had higher average daily weight gain than the females. On the other hand, a comparison between the type of birth showed that the single born lambs were superior to the twins for average daily gain from birth – 90 days of age only. After weaning and between the age periods from 90 – 180, 180 – 270 and 270 – 360 days, the twins were found to gain more than the single born lambs.

Body conformation traits at the age of 90, 180, 270 and 360 days for all the genotypes were compared and analysed. Genotype had very significant effects on the height at wither ($P \leq 0.01$), body length ($P \leq 0.01$), heart girth ($P \leq 0.01$) and back girth ($P \leq 0.01$) in all the age groups while significant effect of sex was observed for the height at wither at 90 ($P \leq 0.01$), 180 ($P \leq 0.01$) and 270 ($P \leq 0.05$) days of age only. The other main effects and the interaction effects were not significant. The males were superior to the females for the height at wither in all the age groups but in the other body conformation traits, the females were generally more superiors than the males. However, the differences were not significant. The effect of the type of birth showed that single born lambs and twins generally had similar body measurements in all the age groups studied.

Studies on the reproductive traits showed that the F_1 and the F_2 crossbreds had their age at first oestrus later than the Cameroon but earlier than their Thai Long Tail parental ewes. The F_1 and F_2 came to oestrus, successfully mated, age at first and second parturition at an almost similar age as well as the length of their gestation periods. However the F_2 was found to have earlier post-partum oestrus than the F_1 and the reverse was observed for the second's. The Cameroon females had the age at first oestrus, age at first successful mating, age at first parturition earlier than the Thai Long Tail genotype but the latter females were earlier than the Cameroon for the age at second parturition and the first and the second post-partum oestrus. Their gestation periods were almost similar.

Least square analysis of variance revealed that the effect of genotype was very significant for age at first oestrus, age at first successful mating and age at first parturition. The effects of genotypes, type of birth, parity of birth and their interaction effects were all not significant for the other reproductive traits under study. The single

born and the twins as well as the lambs from the various parity groups were not significantly different in their reproductive performances.

Estimates of heritability of body weight traits and genetic and phenotypic correlations between the traits were studied using limited data. Heritability estimates for the body weight traits were medium to large (ranging from 0.26 ± 0.62 to 0.90 ± 0.82). The genetic correlation estimates, as expected, were much lower than the phenotypic correlation estimates. The genetic correlations for the F_1 offsprings on their Thai Long Tail ewes and for the F_2 offsprings on their F_1 ewes ranged from –0.07 to 0.25 and 0.06 to 0.38, while the phenotypic correlations for the F_1 and the F_2 ranged from 0.23 ± 0.08 to 0.92 ± 0.55, and 0.51 ± 0.16 to 0.96 ± 0.53 respectively.

This study has indicated that under a tropical environment and under an intensive management system, when good management and good quality diet were available, crossbreds between the hair breed and the wool breed can perform better than either or both the parental breeds. The crossbreds were found to lamb all the year round although the Cameroon were found to have quite an irregular cycle towards their later ages.

Crossbreds with tropical hair sheep have been shown to be more likely to maintain their adaptability and productivity (Fitzhugh and Bradford, 1983) when compared to crossbreds with superior temperate wool breed. Since the crossbreeding of tropical breeds with temperate breeds in many studies were found to have lower productivity when compared to the indigenous breed under traditional conditions, consideration should be given to tropical hair sheep when choosing the breed for crossing. However, tropical hair sheep breeds for crossing should be selected on the basis of superiority in traits (Subandriyo, et. al., 1998) known to need improvement in the local populations.

Other than producing offsprings heavier than either or both the parental genotypes, the choice of crossing with a hair type breed has helped in producing offspring with no wool or with very little wool. The growth performances have shown that although the crossbreds were as heavy or heavier than the woolly Thai Long Tail, they actually reflected that the feed consumed had actually been converted to meat which increased their growth and body compactness. With less wool and more meat, the crossbreds are now more in demand for meat production. Generally, they were also found to have better reproductive performance than either or both the parental genotypes.

A recommendation can be made regarding the choice of breeds to be used for crossing. Selection for parents with less wool is strongly suggested because the partial hair gene effect will be expressed again if the choice of sires and ewes for further crossing is to be done. Crossbreds that expressed more wool usually involved the mating or backcrossing between the hairy crossbreds to the woolly ones; therefore such matings should be avoided to maintain a hairy population. Preliminary studies on the carcass characteristics of the Thai Long Tail and the crossbreds, their performance under integration with oil palm and rubber plantations have been conducted but the results are not presented here.

In conclusion, these studies have shown the advantages of crossbreeding between a tropical hair sheep to a local wool sheep where the crossbreds are found to be better in growth, body conformation and reproductive traits than the Cameroon and the Thai Long Tail. Further improvements can be done by selecting other hair breeds that have higher body weights than the Cameroon used in this study and through crossbreeding of the hair sheep breed with local breeds. The future breeding strategy will be to produce the filial generations or the backcrossing of the filial generation to the hairy parental genotype.