Phenotypic and genetic aspects of production in the Dohne Merino. IV. The influence of age of the ewe on production traits

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To determine the influence of the age of the ewe on characteristics such as body mass, greasy fleece mass, clean fleece mass, fibre diameter and staple length, the data obtained from 500 ewes born between 1970 and 1979 was used.

Their body mass at mating increased from 55 kg to 61 kg between the ages of 1½ and 5½ years after which it declined steeply to the age of 9½ years. Greasy fleece mass increased up to the age of 3½ years (4,53 kg) and then steadily declined up to the age of 9½ years (2,82 kg). In contrast, maximum clean fleece mass was achieved at the age of 1½ years (2,94 kg). Clean fleece mass declined by 17,5% from 1½ to 9½ years of age.

Fibre diameter increased from 21,4 to 23,3 microns between the ages of 1½ and 7½ years after which it declined up to the age of 9½ years. The staple length was 92,2 mm at 1½ years of age followed by a linear decline up to 9½ years of age.

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Vir die berekening van die invloed van ooi-ouderdom op liggaamsmassa, rouwolproduksie, skoonwolproduksie, veseldikte en stapellengte is 500 ooie, wat gedurende 1970 tot 1979 gebore is, se data benut.

Die liggaamsmassa (paring) van die teelooie het toegeneem van 55 kg tot 61 kg met toename in ouderdom van 1½ tot 5½ jaar waarna dit skerp gedaal het tot op 9½ jaar. Rouwolproduksie het toegeneem tot 3½ jaar ouderdom (4,53 kg) en daarna deurgaans gedaal tot 9½ jaar ouderdom (2,82 kg). Teenstrydig hiermee het die teelooie op 1½ jaar ouderdom die hoogste skoonwolproduksie gelewer (2,94 kg). Die afname in skoonwolproduksie van 1½ jaar tot 9½ jaar ouderdom was 17,5%.

Veseldikte het van 21,4 tot 23,3 mikrons toegeneem met toename in ouderdom van 1½ tot 7½ jaar en daarna gedaal tot 9½ jaar ouderdom. Op 1½ jaar ouderdom was die stapellengte 92,2 mm en het daarna reglynig afgeneem tot 9½ jaar ouderdom.

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Introduction

The term FLOCK STATISTICS refers to statistics that concern the reproduction, production and mortality in sheep flocks (Heydenrych, 1975). It is well known that age has an important effect on most of the production characteristics. Various workers have pointed out that the production potential of sheep increases initially and then declines as they get older (Wright and Stevens, 1953; Turner, Brown and Ford, 1968). This indicates that it may be uneconomical to retain animals in the flock beyond a certain age. From a genetic point of view, flock statistics are most useful in the drawing up of effective breeding plans. The effect of age structure on genetic progress is very important in this connection (Turner, 1963; Turner *et al.*, 1968). The reaction of animals to age effects can be determined by the study and measurement of their productive fitness over their entire life span (Nel, 1967).

Because young ewes are mated before they reach maturity, it is self-evident that body mass will increase with age. The influence of age on body mass in the Merino has been investigated by Brown, Turner, Young and Dolling (1966), and Heydenrych (1975) and in the Dormer by Van der Merwe (1976). As far as the effect of age on wool production and wool traits is concerned, evidence has been accumulated by Wright and Stevens (1953); Doney (1958); Turner *et al.* (1968) and Heydenrych (1975).

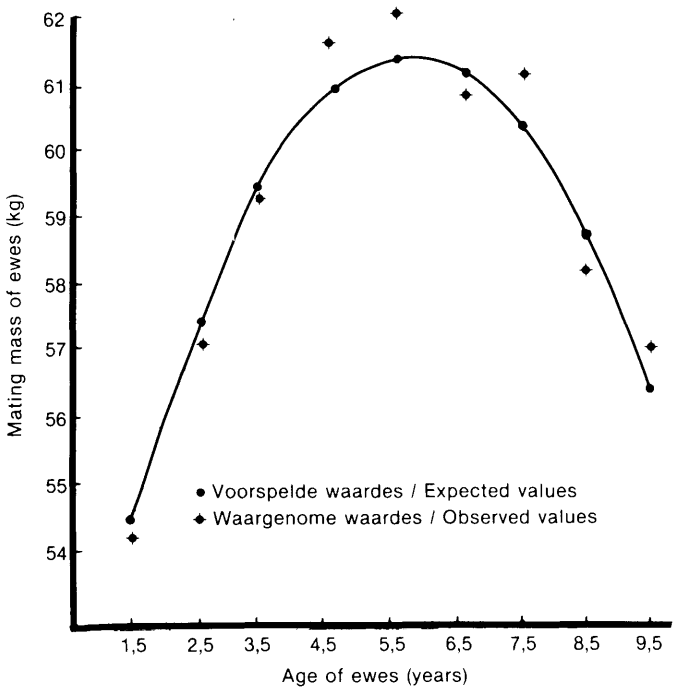
Lopyrin (1938) had already come to the conclusion that the production of late-maturing breeds reaches a maximum at the age of 5 to 6 years, compared to a 3-year-old peak in the case of early maturing breeds.

Procedure

Production data extracted from the development programme of the Dohne Merino were used. A random sample of 500 ewes taken from a total of 4 000 ewes born between 1955 and 1976 was used for the determination of age effects (± 50 ewes per age group) on body mass, greasy wool production, clean wool production, fibre diameter, staple length and clean wool yield. The BMD statistical pack was used for regression analyses.

Results and Discussion

The influence of age on live mass at mating is graphically illustrated in Figure 1. The significant curvilinear re-



$Y = 49{,}058 + 4{,}309x - 0{,}3716x^2$ $SE_{b_1} = 0{,}524$; $SE_{b_2} = 0{,}056$

Figure 1 Regression of mating mass on age of ewes.

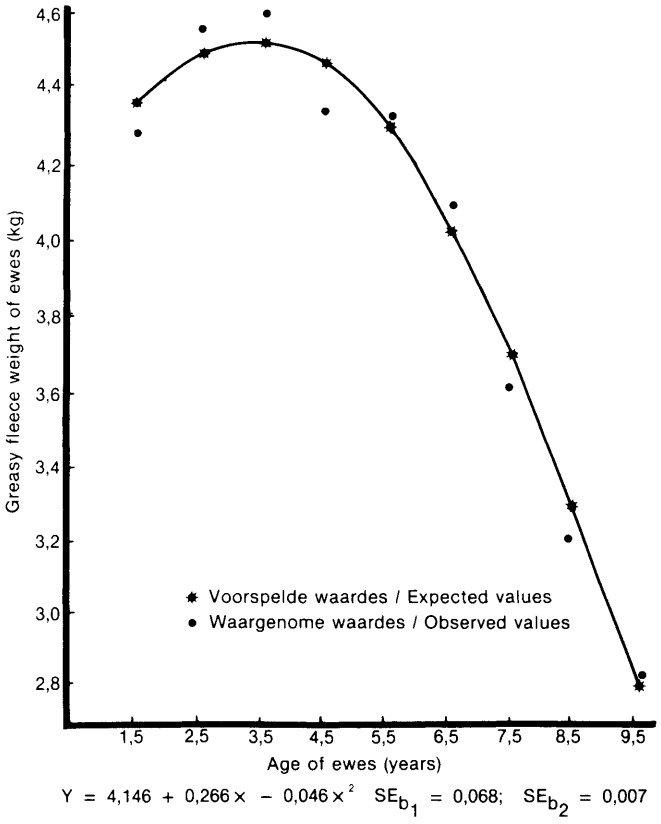
gression line superimposed on the data clearly indicates that body mass at mating first increased and then declined with age. The ewes reached a maximum mass at 5½ years of age. The age at which maximum mass is achieved is an indication of the early or late maturity of the flock. Both Nel (1976) and Turner and Young (1969) observed that Merino ewes reach a maximum mass at the age of 5½ years. On the other hand Heydenrych (1975) found that Merino ewes reach a maximum mass at 4½ years of age. However, Heydenrych's work was done under a high nutritional level. In the case of the Dormer, Van der Merwe (1976) found that a maximum mass is achieved at 3½ years of age while Coop (1973) found that ewes from four different breeds achieve maximum live mass at 5½ to 6½ years of age. It is therefore clear that breed differences do exist, but nutrition and environment may play a role in this respect.

The influence of age on greasy and clean wool production, staple length and fibre diameter is illustrated in Figures 2 to 5. From Figure 2 it is clear that there is a culvilinear relationship between greasy wool production and age. Maximum wool production is achieved at the age of 3½ years, after which it diminishes to 9½ years of age. From a peak of 4,53 kg, wool production decreased to 2,82 kg a reduction of 37,75%. This finding is in agreement with Heydenrych (1975) who also found that maximum greasy wool production occurred at 3½ years of age in Merino sheep. Brown *et al.* (1966), also working with Merinos however, found that maximum greasy wool production occurred at 4½ years of age, while Nel, (1967) found that 1½ year old Merino ewes had the highest greasy wool production. In addition, Brown *et al.* (1966) determined that there was a reduction of 23,5% in greasy wool production after the maximum had been attained. The sharp reduction in greasy wool production after the age of 3½ years is ascribed by Heydenrych (1975) to the increased reproduction rate of the ewes and also possibly, to a decrease in fibre diameter.

As far as the influence of the age of the ewe on clean wool production is concerned, a linear relationship was observed. This is illustrated in Figure 3 and it is noteworthy that 1½ year old ewes produced the most clean wool. The reduction in clean wool production from 1½ to 9½ years of age was 17,5%. Brown *et al.* (1966) found a reduction of 22,4% in clean wool production except that he found the highest rate of clean wool production to occur at 3½ years of age.

It is possible that the relationship between clean wool production and age would not have been linear in the present study had sufficient data been available. In fact, this is what would have been expected and in the light of a peak in greasy wool production at 3½ years of age, the peak in clean wool production at 1½ years of age is surprising. A possible explanation for this anomaly is the fact that a curvilinear relationship opposite to that which occurs between greasy wool production and age, occurs between clean yield and age ($Y = 71{,}67 - 1{,}432x + 0{,}144x^2$; $SE_{b1} = 0{,}796$: $SE_{b2} = 0{,}073$). Although the relationship between clean yield and age was not significant, the fact that the highest values were observed in young ewes and again in old ewes may be the reason why a peak in clean wool production did not occur at the age of 3½ years.

From Figure 4 it is clear that there is a linear relationship between staple length and ewe age. Maximum staple length (92,42 mm) occurred at 1½ years of age, after



$Y = 4{,}146 + 0{,}266x - 0{,}046x^2$ $SE_{b_1} = 0{,}068$; $SE_{b_2} = 0{,}007$

Figure 2 Regression of greasy fleece weight on age of ewes.

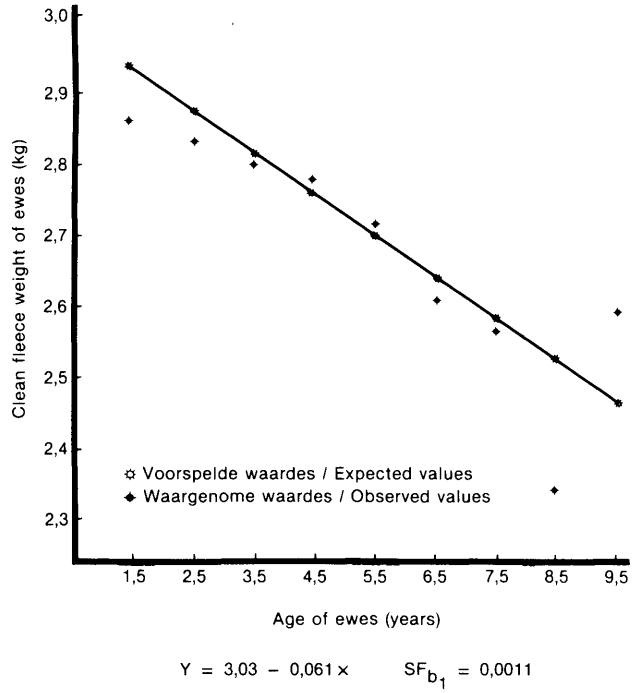


Figure 3 Regression of clean fleece weight on age of ewes.

which there was a regular decline to 9½ years of age (74,21 mm). This finding is in agreement with with the result of Brown *et al.* (1966) regarding the effect of ewe age on staple length in Merinos.

As far as the influence of the ewe-age on fibre diameter is concerned, it appears from Figure 5 that there is a curviliner increase in fibre diameter up to the age of 7½ years, after which it declines slowly up to the age of 9½ years. Brown *et al.* (1966) found however that an increase in fibre diameter occurred up to the age of 6½ years after which it declined.

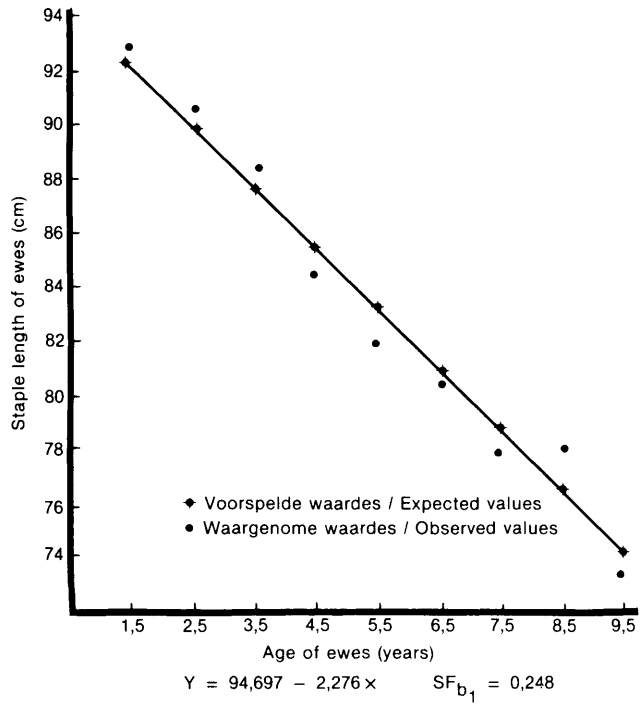


Figure 4 Regression of staple length on age of ewes.

Conclusions

The fact that production characteristics peaked at different ages can have an important influence on the optimum number of ewe-groups in the flock for maximum production.

From the present study it appears that body mass and wool characteristics peak at different ages in the Dohne Merino. Environmental circumstances may however result in differences even within breeds.

It appears that the Dohne Merino is a relatively late maturing breed as far as body mass is concerned. A fact that, according to Van der Merwe (1976), has an influence on the total meat production of the breeding unit. Ac-

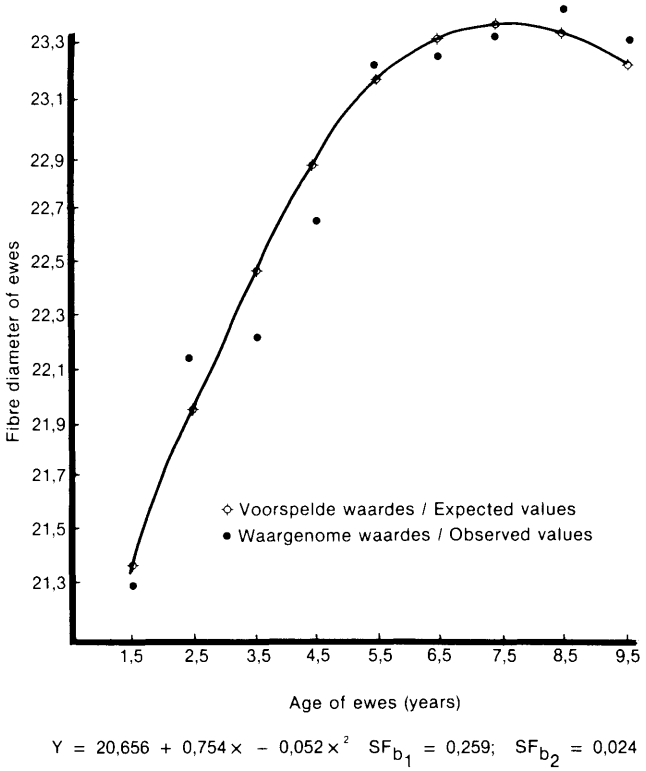


Figure 5 Regression of fibre diameter on age of ewes.

cording to Van der Merwe *op. cit.*, mutton production increases within limits with earlier maturity. As far as wool production is concerned it appears that this reduces sharply after the age of 6½ years. Considering all the relevant production traits, ewes should therefore not be kept for longer than 7 years.

Consequently, in order to determine the optimum flock structure for both maximum genetic progress and optimum productivity, an estimation of ewe productivity in each year of life will be necessary.

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