ANNUAL REPORT

DEPARTMENT OF AGRICULTURE TECHNICAL SERVICES

1 JULY 1978 TO 30 JUNE 1979
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ANIMAL PRODUCTION IMPROVEMENT
BLADSY
Research 1
  Beef Cattle 2
  Mutton Sheep and Goats 2
  Pigs 2
  Poultry, Meat Science 2
  Woolled Sheep 2
  Pelt Sheep, Angora Goats, Dairy Cattle 3
  Milk, Cheese, Butter 3
Dairy Auxiliary Services 3
Supporting Research 16
Livestock and Pastoral Products Improvement Scheme 17
Animal Health 17
  Veterinary Research Institute 18
    Veterinary Research 19
    Technical Relations with Other Countries 20
    Vaccines and Stock Remedies 20
Division of Veterinary Services 20
  Veterinary Research 21
  Vaccines and Animal Remedies 22
  Control of Animal Diseases 22
  Diagnostic Services 22
Meat Hygiene 24
Grazing Utilisation Research 24
  Natural Grazing 25
  Artificial Pastures 25
  Feed and Forage Crops 26
ANIMAL PRODUCTION IMPROVEMENT

RESEARCH

BEEF CATTLE

Where dual-purpose and British beef breed cows were run at Cedara on kikuyu pastures at stocking rates of 4,2 and 6,7 cows with calves per ha, the waning masses of the calves were 209 kg and 177 kg respectively and the live mass production 720 and 570 kg per ha for the lower and higher stocking rates.

Supplementation with a winter lick containing urea (as against a dicalcium phosphate lick) for lactating cows on highland sourveld in Natal at the stocking rate treatments of 1,0 and 1,67 LSU/ha had a significantly favourable effect on mass increase.

_Eragrostis curvula_ which had been cut for hay and had rained wet was ensiled without any further additions. The silage was compared with _E. curvula_ hay for the overwintering weaner heifers at the Thabamhlope Research Station.

During the first year of the trial the heifers lost 6,47 kg of live mass on the silage over a period of 110 days, as against a mass increase of 22,8 kg on the ha. During the second year the heifers lost 10,8 kg on the silage over a period of 78 days, as against a mass increase of 24,7 kg on the hay.

An average daily increase of 0,67 kg was obtained by replacing half the silage with hay.

The computer simulation model, NSBFT, which was very successfully used in beef cattle production systems in Natal, recently underwent further refinement with the development of more realistic formulas for the prediction of voluntary feed intake, digestible crude protein requirements and carcase price.

An improved method of cost estimation was also built into the model and the data norms were considerably simplified.

At the Animal and Dairy Science Research Institute investigations are being conducted into the value and the roughage properties, as they are known, of certain types of roughage, and especially into the ability of roughage to maintain a healthy rumen environment in high concentrate rations for beef cattle. The desirable level of inclusion of each type of roughage in the finishing rations was also quantified in the investigation. The optimum levels of inclusion were as follows:
A haemolytic test for the blood-typing of cattle.

Sunflower hulls - 10%, bagasse pellets 25% and *Eragrostis* curvula hay - 20-25%. It was interesting to observe that the optimum level of inclusion changed with the size of the screen used for milling the hay. When a 51mm screen was used the desirable level of inclusion was 15%, whereas 35% had to be included when a 6,4mm screen was used.

One of the most important reasons why concentrate supplementation is frequently the digestion of roughage in the rumen is occasionally suppressed by the organisms that digest concentrates, with the result that roughage is frequently not well utilised and the intake drops.

There is a possibility that the adverse effect on roughage digestion could be counteracted by changing the form of the concentrate, in this case the maize kernel. Four forms of the maize kernel were used in the investigation, namely whole kernels, whole kernels treated with caustic soda, which breaks the outer skin of the kernel, crushed maize and meal.

The results showed that roughage intake (*Eragrostis curvula*) decreased in direct proportion to the increased level of supplementation and that there was no difference between the various forms of maize.

The digestibility of the roughage was approximately 55%, that of the whole kernel maize 60%, the caustic soda-treated whole kernels 82%, the crushed maize 72% and the maize meal 88% on the dry basis. The intake of digestible material rose in direct proportion to the level of supplementation so that the highest intake and growth and the best feed conversion were obtained at the highest level of supplementation. It was evident that the group fed on meal grew best and maintained the best feed conversion.
An investigation into the effect of phosphorus supplementation on the performance of beef breed cows on veld grazing at Armoedsvlakte and Glen has so far shown that phosphorus supplementation, particularly at Armoedsvlakte, is beneficial to the body mass, voluntary feed intake and bone phosphorus status of lactating cows.

According to previous experimental results in the Highveld Region maize silage containing about 40 per cent grain (dry basis) provided sufficient energy but too little protein to finish cattle effectively. It has now been found that the inclusion of 11.5 per cent crude protein (dry basis) in both silage and concentrate rations is sufficient to round off eighteen-month-old oxen successfully.

Experimental work during previous seasons has shown that at Potchefstroom fertilising the veld can boost the large stock stocking rate by 100% - 150% during summer and autumn and increase veal production by 113% - 163% without harming either the veld or the animals in any way.

During the year under review Merino ewes with lambs were included in the study with Simmentaler cows and calves in a sheep: cattle ratio of 5:1. Fertilising boosted the stocking rate by 160%, the mass increases of the lambs by 18% and the mass increases per ha (calves plus lambs) by 164% of the figures for unfertilised veld.

At Soutpan, a demonstration farm for extensive cattle farming, the proven success of optimum veld utilisation and effective herd management has now been determined in monetary terms as well. At present a gradual switch is taking place to an ox system with a marketing age of 30 months. The manipulation of the market, e.g. by preparing animals for December slaughtering, when prices are considerably higher than during the rest of the year, is also being investigated.

Lucerne and eragrostis silage, ensiled by the vacuum method, were tested at the Nootgedacht Research Station as winter feeds and compared with lucerne and eragrostis hay. The average mass increases over a period of 84 days were -4, +13, +21 and +26 kg for eragrostis silage, Lucerne silage, eragrostis hay and Lucerne hay respectively. The high moisture percentage of the silages may have had a limiting effect on dry matter intake.

The average conception percentage at the Athole semi-intensive unit over eight years was 91.2 per cent and the average conception percentage in heifers calving for the first time was 100 per cent.

Another achievement for Athole was a calving intensity of 92 per cent within the first 25 days of the calving season. The calves were waned at an average mass of 234 kg at 240 days.

**MUTTON SHEEP AND GOATS**

An investigation into the carcase composition of the lambs of four sheep breeds and of the Boer goat is being carried out at the Animal and Dairy Science Research Institute at Irene. The quantities of muscle and fat are important in that they determine the meat yield of a carcase, distribution is also important since it determines what the proportion of "expensive" to "cheap" meat in the carcase will be.
It was found that at comparable dressing masses between 10 and 41 kg of live mass the proportion of muschel in the forequarters to that in the hindquarters is higher in Boer goats than in sheep.

Studies on the utilisation of non-protein nitrogen are done by providing animals with re-entrant duodenal cannulae.

The sheep breeds studied were the Merino, the South African Mutgton Merino, the Doper and the indigenous breed from the Northern Transvaal, namely the Pedi.

The last two types, which were fatter throughout that the two Merino types, had proportionally more muscle in the cheaper brisket than in the hindquarter that dit the Merino types, especially at the higher dressed masses.

As in the case of the muscle distribution in the carcase, important fat distribution patterns were also established. It was clear that considerably less of the Boer goat's muscle and fat is hound in the expensive buttock meat than is the case with sheep. Subcutaneous or superficial carcase fat is the fat depot of the carcase, which is evaluated when the carcase is marketed in order to determine market readiness. An optimum amount is necessary to protect the carcase against drying out and make the meat more flavoursome. However, excess subcutaneous fat is trimmed off by the consumer before the meat is eaten and is therefore a drawback. Knowledge of the optimum slaughtering stage with regard to carcase fat in slaughter stock is of great economic importance in lamb and mutton production.
Good progress was made in the Karoo Region with the development of a white-woolled mutton sheep for the extensive Karoo sheep pasture areas. The stage has now been reached where farmers can be involved in the further development of the breed.

Notwithstanding the severe drought of the past year the new breed has done very well and has shown a relatively high breeding capacity, namely 70%. The body masses of ram and ewe lambs at twelve months were 38,8 kg and 34,4 kg, respectively.

In trails at Cedara in which the promotion of increased mutton production under intensive conditions was studied, researchers were able to achieve three lambing seasons within the space of two seasons.

The dry grass/bush communities comprise about 2,0 million ha or 40% of the natural pastures of the Eastern Cape Region. The ecology of these marginal rainfall areas has been disturbed by (i) overgrazing, (ii) inadequate veld management systems and (iii) the absence of the browser as a component of the stock-farming system.

Instead of bush removal at a high cost (R30/ha), an adapted livestock production system was introduced at Adelaide. It comprised the following:

(i) A new approach to the multiple utilisation of various types of vegetation.

(ii) The inclusion of the Boer goat as a full component of the stock-farming system, together with beef cattle.

In the light of the following production data, this system would appear to be very promising for similar livestock production systems in an area comprising almost 40 million ha of pastures in the Republic.

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<thead>
<tr>
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<tbody>
<tr>
<td><strong>Boer goats</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ewes lambed (%)</td>
<td>97</td>
<td>99</td>
<td>100</td>
</tr>
<tr>
<td>Lambs born (%)</td>
<td>177</td>
<td>191</td>
<td>151</td>
</tr>
<tr>
<td>Lambs weaned (%)</td>
<td>143</td>
<td>184</td>
<td>105</td>
</tr>
<tr>
<td>Weaning mass (kg)</td>
<td>29,8</td>
<td>28,2</td>
<td>28,0</td>
</tr>
<tr>
<td>Mass of young ewes - 18 months (kg)</td>
<td>53</td>
<td>50</td>
<td>-</td>
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</table>

| **Beef cattle** |         |         |         |
| Calves born (%) | 86      | 94      | 91      |
| Weaning mass (kg) | 254     | 262     | 271     |
| Adapted weaning mass (kg) | (210 days) | 232 | 238 | 257 |
| Mass of cows at weaning | 498 | 519 | 554 |

The overwintering of sheep in the Highveld Region remains one of the basic problems for the researcher in his attempts to work out a flow programme for the provision of feed over a period of a year. Research is consequently geared to the evaluation of locally available sources of roughage as feeds for full-grown sheep and slaughter lambs.
The evaluation of dry roughage feeds is virtually complete and special attention is being given to silage and annual soilage feeds for use in slaughter lamb production.

**Silage for slaughter lamb production**

Previous results have shown the lambs can be successfully finished on 70 per cent maize silage and 30 per cent concentrates, provided that the crude protein content of the total ration (silage plus concentrates) is 14 per cent.

In a follow-up study it was found that, when used as a nitrogen supplement to maize meal rations or maize silage (with a normal grain content) upon ensiling, natural sources of protein, such as fish-meal, produce a significant increase in the growth rate in comparison with Starea and urea as the nitrogen supplement.

It was also found that from 17 kg (weaning mass) to 30 kg of live mass the total protein content of the ration should be 14%.

Maize meal supplementation to maize silage fed *ad lib.* should be 1% of the body mass per day.

**Annual winter soilage crops in slaughter lamb production**

At the Bethlehem Research Station soilages that included oats, rye, ryecorn, wheat and rye-grass cultivars were compared with a control ration consisting of equal parts of Lucerne and maize meal.

The lambs (South African Mutton Merino) that received the Lucerne and maize meal mixture grew most rapidly, but the cost was highest and this ration was the least profitable.

The various soilages, particularly ryecorn, all provided cheaper finishing rations and yielded a far higher profit than the control ration.

In the Eastern Free State winter soilage therefore holds great potential for boosting mutton production per unit area.

**PIGS**

**Nutrition**

A digestibility study with pigs was conducted at the Animal and Dairy Science Research Institute to determine the effect of formaldehyde treatment on the protein and energy digestibility of bird-proof grain sorghum.

Formaldehyde treatment increased protein digestibility from 57% to 73%, and the protein ingested by the pigs was better utilised in that the efficiency of utilisation rose from 12% to 27%. Energy digestibility was also improved, but only slightly.

A long-term study in which weaning at three weeks was compared with conventional weaning at five weeks has recently been concluded.
The reproduction cycles of the early-waned sows were reduced by 14.1 days on average, which resulted in these sows producing 2.52 litters a year, as against 2.30 for the group weaned at five weeks. In addition sows in the group that was weaned early reared 2.6 more piglets a year (22.16 as against 19.52).

**Low-cost pig rations**

A number of supplementary computer programmes were developed at Cedara in order to simplify the use of linear programmes for the calculation of low-cost pig rations. One of these programmes prepares the input data required for the linear programme, and another programme makes outputs from the linear programme available in an easily understandable form.

The linear programme has already been used to compose low-cost rations for farmers.

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The determination of C + K measurements in pigs
POULTRY

Poultry performance testing

Egg production tests

At the conclusion of the thirteenth random sample egg production test at Glen a hen-housed average of 248.65 eggs per hen was obtained, and the figure for the eighth test at Irene was a hen-housed average of 240.79 eggs per hen up to an age of 504 days.

These tests are not only useful in evaluating local breeding material but also provide a valuable means of evaluating overseas material with a view to the possible importing of breeding stock.

During the year under review only one firm imported broiler breeding material. Since permission to import poultry was granted in 1972, 151,785 head of poultry breeding material have been imported, 5,219 of which were donated to the State.

To date 15,612 dozen fertilised eggs and 1,443 birds derived from donation to the State have been sold to farmers.
MEAT SCIENCE

Refrigeration of carcasses

In order to determine what factors play a part in the loss of mass during the refrigeration of recently flayed beef carcasses, a comprehensive investigation was undertaken a few years ago by the Animal and Dairy Science Research Institute and the Veterinary Research Institute, in co-operation with the CSIR.

It was found that the humidity and air velocity in the cold-room do not have a notable effect on the loss of mass during the prechilling period (usually one or two days).

The two carcase factors that have an important influence are the mass and the fatness of the carcase. Larger and fatter carcases show a lower percentage mass loss than smaller and leaner carcases.

A second, very important aspect that emerged from this work is the potentially harmful effect of rapid chilling of carcases on the eatability of the meat. By legislation, in South Africa carcases have to reach a temperature of no higher than 7°C in the deepest part of the carcase before the meat may be removed from the abattoir. If this temperature has to be reached within a relatively short period of
chilling, rapid chilling methods are used, with the result that the muscle temperature may drop to 10°C and below within 10 hours of slaughtering, which produces cold shortening and toughening of the meat. This is especially noticeable in the back muscles and certain muscles of the buttock.

The back muscles represent 20% of the meat yield and 31% of the monetary value of a carcase and if they are tough the consumer gains a very negative impression of the eatability of the meat.

Such toughening can, however, be prevented if the muscle glycogen content is reduced directly after slaughtering to the point where muscle contraction can no longer take place when a muscle temperature of below 10°C is reached.

In order to reduce muscle glycogen rapidly after slaughtering, a 500 volt electric current is passed though the carcases at a frequency of 12.5 herz for 60 seconds. This treatment was found to produce a difference of 50% in the toughness of electrically stimulated and non-stimulated carcases after rapid chilling.

The meat of non-stimulated carcases was found, both on evaluation by a panel of tasters and after the physical measurement of toughness, to be unacceptably tough whereas the stimulated carcases were found to be acceptably tender.

This technique could be very usefully applied in the South African meat industry to achieve optimum eatability.

A further method of preventing cold shortening in muscles which was investigated was the chilling of carcases at higher air temperatures.

**Carcase grading**

The Animal and Dairy Science Research Institute has been engaged during the past four years in evaluating the current beef grading system in South Africa. A sample of a few thousand carcases, representative of all grades, was selected and several determinations in respect of carcase fatness, mass and conformation were carried out on each carcase in order to determine grade characteristics.

The eatability of the meat was also determined according to physical, chemical and organoleptic characteristics in order to determine whether the carcase grade and age of the animal play a part in determining eatability.

Carcases of the higher grades (Super, Prime and I) had more removable fat than carcases of the lower grades (II and III), and the differences found among the three higher grades were smaller than the differences between the three higher grades on the one hand and the two lower grades on the other hand. Th fatter carcases also produced a lower yield of deboned, saleable meat and even had less meat in the more expensive carcase cuts.

The eatability of the meat is affected not so much by the grade as by the age of the cattle. Meat from animals with a maximum of two permanent incisors is notably more tender (18%) than that from older animals.
The two carcase characteristics that are judged in order to determine cutability are market readiness (external fat cover) and fleshing (external conformation or fullness). These ought to provide an indication of the edible yield of the carcase.

Gradres are successfully able to judge fatness on the basis of the visible market readiness. However, the values obtained in the judging of fleshing bear no relation to the meat yield of the carcase.

It therefore appears from these results that the fatness and the age of an animal are the two most important factors in determining the meat yield and the eatability of the meat.

WOOLLED SHEEP

In the course of an investigation in the Karoo Region into the elimination of quality defects in Merino wool it was found the deliberate selection for good quality, with over-emphasis on softness of feel, produces a higher degree of undercrimping, a characteristic with decided disadvantages.

Research also showed that a large percentage of the Merino wool clip in the Karoo farming areas is badly and deeply weathered. Producers are advised to provide sufficient shade in grazing camps and to arrange shearing times, if possible, in such a way that the wool is not allowed to grow too long during the summer months.

With kikuyu, Rhodes grass, *Eragrostis* curvula and Lucerne pastures as the basis, the following production figures were obtained with Dohne Merino ewes in the Eastern Cape during the first three successive reproduction cycles of eight months each:

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>Cycles (of 8 months each)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1</td>
</tr>
<tr>
<td>Ewes lambed (%)</td>
<td>88</td>
</tr>
<tr>
<td>Lambing percentage</td>
<td>140</td>
</tr>
<tr>
<td>Meat production/ha (kg)</td>
<td>120</td>
</tr>
<tr>
<td>Wool production/ha (kg)</td>
<td>22</td>
</tr>
<tr>
<td>Gross margin/ewe</td>
<td>R5,50</td>
</tr>
</tbody>
</table>

At the Nooitgedacht Research Station green kikuyu grazing was studied as a finishing ration for old ewes. Maize meal was provided as supplementation. The profit was R1,23 per ewe higher than the profit on the controls. Green kikuyu grazing therefore has decided economic advantages over the conventional finishing ration.

The finishing of lambs on rations containing various levels (10%, 40%, 70% en 100%) of Lucerne as roughage was also investigated at Nooitgedacht.

The group on 40% Lucerne did best and attained a live slaughter mass of 56,6 kg, as against 35,0 kg for the group (of the same age) on 100% lucerne.

Lambs on 70% Lucerne also did well, whereas those on 10% lucerne showed surprisingly poor growth when the quality of the ration is taken into account.
When various levels of *E. curvula* hay were included in the finishing rations for old, culled ewes it was found that eragrostis hay can be used to good effect. A profit over feed costs of R2,00 per ewe was obtained.

At the Athole Research Station an average inter-lambing period of 270 days and ten lambing seasons during the 6½-year period from May 1972 to December 1978 were obtained on the semi-intensive unit. The average lambing percentage was 79.3%, with an average corrected weaning mass of 23 kg.

**PELT SHEEP**

Good progress is still being made with the breeding of grey and white pelts. The dominant white at the Kalahari Research Station is very important here.

A histological investigation into ante-natal pelt development in four Karakul lines (pipe curl, developed shallow curl, shallow curl and watersilk) undertaken at the Animal and Dairy Science Research Institute at Irene has been concluded. A survey was made of pelt and follicle characters in order to try to identify possible differences between the four types.

The pipe curl line shows the thickest skin and the deepest and most oblique follicles of the four types. Deviations from the normal round or elliptical shape were also observed in the pipe curl line, where some of the fibres have an uneven appearance.

Progress with selection for four important pelt characters is being measured in a comprehensive breeding trial with Karakul sheep in the Free State Region. The percentage progress in the fourth generation (the control) was as follows for the four characters: Curl type - 58%; hair length - 28%; pattern - 25% and hair quality - 25%. Progress has been made with selection for twins: a figure of 10% has been attained, as against 4% in the control group.

The project aimed at developing a chocolate brown Karakul pelt with light golden or silver hair tips has made good progress. It is clear at this stage that the light tips, which are highly heritable, are the most important factor in determining the value of the pelts. It has also been found that mating chocolate brown animals produces a progeny in which 50% to 60% are also chocolate brown.

An investigation into the nutritional value of Orange River broken veld (hard veld) and Kalahari duneveld (soft veld) has produced very interesting results. Both veld types are able to satisfy the nutritional requirements of dry ewes in respect of crude protein and energy.

**ANGORA GOATS**

Research has been carried out in the Karoo Region on the effect on Angora goats of the level of energy and protein nutrition in respect of perinatal losses, lactation and the growth of kids.

Various levels of energy nutrition affected the average daily milk production during the lactation period very significantly. The effect of various levels of protein nutrition on the average daily milk production increased during the lactation period.
Within six hours of birth there were notable differences in the colostrums production of goat ewes in the various experimental groups.

The proportions in which the various milk components occurred were considerably more affected by the various energy levels than by the protein levels. Kids born to experimental ewes kept on low protein and/or energy nutrition were more inclined to weigh under 2 kg.

A six and eight week fattening programme for Angora goats produced more or less the same results as in the case of Merino sheep. As in the case of the sheep, six weeks of fattening was more profitable than eight weeks, but the results show that the fattening of Angora goats is uneconomic.

Reproduction studies were directed at the endocrinological mechanisms that cause abortion in Angora goats. Pregnant Angora ewes were treated with synthetic prostaglandin and regular blood specimens were taken for the determination of progesterone. All the treated animals aborted. Circulatory progesterone showed a marked decreased within four hours of treatment.

**DAIRY CATTLE**

**Nutrition**

Despite the high feed production potential of the Highveld Region (about 42 per cent of the Republic's dairy products and fresh milk is produced in this Region), a great deal can still be done to improve the average lactation production of 1 500 kg per cow and the general profitability.

The matters being investigated at present include the utilisation of artificial pastures, the development of a suitable complete diet which could save a great deal of labour and the efficient rearing of calves.

Preliminary data at the Bethlehem Research Station indicate that with the correct forage cultivars, fertilising, planting time and methods of moisture conservation the feed costs per kg of milk could be reduced to less than the cost of a conventional balanced ration.

Preliminary results indicate that the inclusion of sheep manure (20% to 30%) in the concentrate mixture for dairy cows could restrict the voluntary intake of concentrates to an ideal level.

The optimisation of the soya mela, they powder and colostrums contents of milk surrogates for rearing dairy calves is being investigated at the Potchefstroom College of Agriculture at present. Preliminary results indicate that a reduction in the mass increase occurs when the whey powder levels exceed 50 per cent of the ration, but that various soya meal levels (10 to 20 per cent) have no effect. The practice of basing energy supplementation for dairy cows on dry matter intake and the concentration of energy in the ration is being very successfully applied in the Natal Region.
Mangement

The computer programme DAISI, which was developed by Cedara and is still undergoing improvement, is an important aid in the planning and management of several Natal dairy farms. This programme was also used in the Winter Rainfall Region in 1978.

MILK

A survey was conducted to establish the insecticide content of South African dairy products. None of the samples exceeded the DDT international maximum residue limits. However, the quantities of BHC found exceeded the international standard in 67% of the samples, as did the quantities of dieldrin in 32% of the samples. The presence of dieldrin in milk is most likely the result of misuse of the pesticide.

Ultra high temperature (UHT) milk production has been introduced by 4 processing plants, but difficulties experienced at these plants required assistance from the Institute. A pilot UHT plant has been made at the Institute to test:

- survival of thermophilic organisms,
- survival of enzymes secreted by psychrotrophic bacteria during raw milk storage, and
- the effects of the above-mentioned factors on protein breakdown and the keeping quality of this product.

CHEESE

Mould growth on cheese should be regarded as not only an economic problem but also a potential health hazard. The treatment of the cheese surface with plastic emulsions containing antifungal substances merely delays mould growth. At the present time there is no evidence that mycotoxins produced by penicillia in mould-ripened cheese, such as blue-veined or Camembert cheese, present a health hazard to the consumer.

Attempts are being made to produce a low-fat cheese which has an acceptable flavour, but which provides relatively few kilojoules. So far the main difficulty has been to achieve an acceptable flavour; an acceptable texture has already been successfully produced. The use of special bacterial cultures for flavour development is now being investigated.

Whey utilisation

With a cheese production of 28 000 tons per annum in South Africa an almost equivalent quantity of milk solids is being either underutilised or wasted. Research
has been carried out on a wide field of possible products from whey for commercial use.

The preparation of magou by using cheese whey, whey powder or whey protein concentrate is being investigated. This not only increases the nutritional value of magou but produces a more palatable product, and provides a further means of utilising whey.

Attention was also paid to the development of dairy products containing whey instead of milk as the main ingredient. A whey-kefir and a chocolate whey drink were successfully developed. These products have a high nutritional value and a pleasant and refreshing flavour and can be prepared more cheaply than yoghurt.

This research gave rise to a successful symposium on whey utilisation at the Animal and Dairy Science Research Institute, in which several overseas visitors participated.

The manufacture of high protein whey powder by means of ultrafiltration:

In this process the protein content can be adjusted to consumer requirements (30-90%), depending on demand. Various applications of this whey powder, from ice cream manufacture to the manufacture of infant foods have been investigated. Various methods of composition control have been successfully tested for practical application in the industry.

BUTTER

Because of the diet consciousness of the consumer, work has been carried out on the production of a low-fat spread and a low-fat cheese.

These products are receiving increased attention in overseas countries, but because most of the manufacturing procedures have been patented, research is necessary before these products can be manufactured locally.

A low-fat spread which will be spreadable at refrigeration temperatures and will be able to compete with margarine on the consumer market is being developed. The new product is intended to have half the fat content of ordinary butter and a 20% higher protein content. These products have been consumer tested and have been favourably received.

DAIRY AUXILIARY SERVICES

Quality improvement laboratory

During the past year quality determinations were carried out on butter, cheese, milk powder, pasteurised milk, yoghurt, cottage cheese and ice-cream. Over 3 000 analyses were also carried out for the Dairy Control Board with a view to the possibility of importing butter and cheese.
The average values for the various tests on butter were generally better than the previous year. Undesirable coliform organisms do, however, occur in a large number of samples.

The pH and acid values, percentage salts and results of organoleptic judging were very good and complied with the Class I standards of the Animal and Dairy Science Research Institute.

Sixty samples of milk powder were analysed. The results are indicative of good quality control at the factories that submitted the samples.

At the milk testing laboratory at Elsenburg milk tests were carried out for 13 000 cows for the Winter Rainfall Region - an increase of 1 000 over the figure for the previous year. The analytical methods were refined, the various pieces of infra-red analytical apparatus throughout the country were checked and working methods were standardised.

SUPPORTING RESEARCH

Feed evaluation

Research at the Animal and Dairy Science Research Institute showed that the voluntary intake by sheep of kikuyu grazing is undoubtedly lower than is normally the case with other types of grazing of similar quality. This finding bears out observations by farmers that stock sometimes fail to thrive on kikuyu pastures.

No satisfactory explanation for this phenomenon has been found as yet.

Feed improvement

Research on the chemical improvement of low-grade roughage has been unable to show any adverse effect on animals that is related to the use of straw treated with caustic soda. However, caustic sodat treatment is frequently less successful in practice because the directions for treatment are not all carefully observed. The use of chemicals other than caustic soda for this purpose was also investigated.

Feed flow planning

The Natal Region is making good progress with the development of computerised programmes for the planning of livestock production enterprises, especially with regard to the problem of feed supply. The programmes already in use have greatly simplified the planning and implementation of feed production strategies and several farms are already involved.

A specialist extension officer was specially appointed to carry out feed flow planning and promote the use of the computer for this purpose. The aim is to introduce an automated procedure according to which a farm can be planned or replanned within a day after the basic surveys have been carried out.
LIVESTOCK AND PASTORAL PRODUCTS IMPROVEMENT SCHEMES

NATIONAL BEEF CATTLE PERFORMANCE AND PROGENY TESTING SCHEME

Interest in performance testing as an aid in selection has reached a new peak, particularly in the stud industry. Three breed societies have already made performance testing compulsory for all their members and other breed societies may possibly follow.

As Table 1 shows, the membership increased by only six during the past year, but there was a decrease in commercial producers and a satisfactory increase in stud breeders.

The number of mass determinations increased by 10 730, notwithstanding the drought in certain areas, where breeders even had to move their stock and no masses were determined.

As Table 2 shows, the number of bulls subjected to growth tests increased by 141 during the past year.

Twelve progeny groups were subjected to carcase evaluation during the past year. The edible meat yield, carcase value and meat quality are being intensively studied.

PERFORMANCE TESTING OF WOOLLED SHEEP

The steady increase over the past few years of about 3 000 wool samples in the number of samples analysed \textit{per annum} at the Fleece Testing Centre continued. In all 26 061 samples were analysed, an improvement of 2 976 on the record number of the previous year.

Performance testing of woolled sheep has become a firmly established practice. This may be ascribed mainly to sustained extension work. A total of 844 breeders and officers have so far attended the short courses held by the Fleece Testing Centre.

A computer programme for processing performance data has been developed. Because the crimp: fibre thickness ratio is such an important quality characteristic of apparel wool, it is also calculated. The programme also makes provision for corrections for birth status and the age of the mother, and for the calculation of a selection index. A complete progeny test on the rams in regular use is also provided. In general this development met with considerable approval from breeders.

\textbf{TABLE 1 - Number of members and masses recorded}

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Transvaal</td>
<td>407</td>
<td>340</td>
<td>86 837</td>
<td>91 849</td>
</tr>
<tr>
<td>Natal</td>
<td>200</td>
<td>204</td>
<td>60 320</td>
<td>55 545</td>
</tr>
<tr>
<td>South-West Africa</td>
<td>147</td>
<td>151</td>
<td>48 069</td>
<td>51 754</td>
</tr>
</tbody>
</table>
TABLE 2 - Number of bulls subjected to growth tests

<table>
<thead>
<tr>
<th>Centre</th>
<th>Bulls tested</th>
<th>1977</th>
<th>1978</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Departmental centres:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Irene</td>
<td></td>
<td>266</td>
<td>233</td>
</tr>
<tr>
<td>Vryburg</td>
<td></td>
<td>272</td>
<td>263</td>
</tr>
<tr>
<td>Queenstown</td>
<td></td>
<td>133</td>
<td>159</td>
</tr>
<tr>
<td>Cedara</td>
<td></td>
<td>33</td>
<td>149</td>
</tr>
<tr>
<td>Omatjenné (SWA/Namibia)</td>
<td></td>
<td>35</td>
<td>18</td>
</tr>
<tr>
<td>2. Non-Departmental centre:</td>
<td></td>
<td>55</td>
<td>117</td>
</tr>
<tr>
<td>Potgietersrus</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. Tests carried out on farms:</td>
<td></td>
<td>1 538</td>
<td>1 562</td>
</tr>
<tr>
<td>Republic</td>
<td></td>
<td>186</td>
<td>158</td>
</tr>
<tr>
<td>SWA/Namibia</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>2 518</td>
<td>2 659</td>
</tr>
</tbody>
</table>

NATIONAL MUTTON SHEEP PERFORMANCE AND PROGENY TESTING SCHEME

Pig recording and health phase

At the end of the year there were 46 active members, ten fewer than the previous year. The reduction in the number of active members may be ascribed largely to the considerable increase in the feed prices, which prompted many small breeders to leave the industry.

Performance testing (boars and sows)

Despite the drop in the membership, 1238 boars were tested, which is 5% more than the previous year. The demand for boar testing at Elsenburg is so keen that no gilts are being accepted for testing. Moreover, 50% of the applications for the testing of boars had to be refused owing to a lack of testing facilities.

Irene has twide the capacity of Elsenburg, but tested fewer boars. This is because progeny testing is centred at Irene, where all the progeny groups have to be housed.

The lowest average feed conversion (2.72) was obtained at Irene and the highest (2.90) at Cedara. Irene and Cedara had the same average C + K (39 mm), but the
figure for Elsenburg was very low (30 mm), i.e. the Western Cape has Landrace and Large White strains, which are very thin.

Halothane testing

The Pig Testing Advisory Committee decided that all piglets that arrive at the testing centres for performance or progeny testing should be tested for sensitivity to stress with the aid of halothane gas. If a positive reaction is obtained the pigs in question should be slaughtered.

Sensitivity to stress among South African pig herds is a cause for concern because stress-sensitive pigs soon die when exposed to any form of stress. Stress-sensitive pigs also produce poor quality meat known as PSE (pale, soft and exudative), which could have a very bad effect on the industry.

The results revealed major differences - 12% positive for Landrace boars and 1% for Large White boars. These results are corroborated by overseas research. Major breed differences occur. It is generally accepted that the Pietrain is about 100% sensitive, Large White about 1% and the various Landrace lines between 10% and 30%.

NATIONAL DAIRY CATTLE PERFORMANCE AND PROGENY TESTING SCHEME

Both the volume and the quality of work for this scheme reached a new peak. With regard to the performance testing scheme, the following changes took place in comparison with last year.

- The number of herds increased from 1 040 to 1 092.
- The number of individual samples tested (butterfat, protein and lactose) increased from 646 000 to 689 600.
- The number of Frisian cows tested (72% of all cows) increased from 36 976 to 37 328.
- The number of cows tested per month was 56 061, and 77 613 individual lactation records were issued, as against 69 742 the previous year.

An important new development was the introduction of a biological and economic analytical and advisory service for the herds participating. This service is offered in co-operation with the Department of Agricultural Economics and Marketing.

With regard to the progeny testing scheme, 219 young bulls were nominated for consideration as test bulls for the AI industry during the year. Ninety-five were found acceptable and 39 were purchased.

Semen from 45 bulls was distributed to test herds. Thirty-four of these bulls were Frisians, 5 were Jerseys, 3 Ayrshires and 3 Guernseys.

Contracts were entered into with 343 herds for 17 010 test cows. Of this number 243 were Frisian herds, with 12 293 test cows, and 74 Jersey herds, with 2 162 test cows.
ANIMAL HEALTH

VETERINARY RESEARCH INSTITUTE

The drought during the year under review had an inhibiting effect on diseases generally, especially on infectious diseases, with the result that fewer unexpected demands were made on the vaccine production and specialised diagnostic sections of the Institute. This, together with the farmer's poor economic position, resulted in a drop of almost 17 million (9.8%) doses in the total issue of vaccines, reducing this total to 154.2 million doses.

African swine fever, which caused great consternation in international veterinary circles by the way it was spreading abroad, once more received considerable attention.

New viral diseases of turkeys have been discovered and are being intensively studied, and at the same time progress is being made with the investigation of coryza, Newcastle disease and the poultry diseases caused by mycoplasmas. Good progress has been made with the projects on the causes of geeldikkop and jaagsiekte.

Laboratory investigations have shown that poisoning from pesticides and urea, chiefly as a result of negligence, is still among the most important causes of cattle losses.

VETERINARY RESEARCH

DISEASES OF CATTLE

Bacterial diseases

A method was found to grow Campylobacter fetus, the cause of vibriosis of cattle, on a large scale in fermenters. This method made it possible to eliminate the backlog in the production of vaccine against this important venereal disease and to meet the steadily mounting demand for this vaccine.

Promising results were obtained in rabbits with a trial vaccine against Staphylococcus aureus, a cause of mastitis in cattle, and this led to a field trail in which the vaccine was tested in dairy cows. This trail has not yet been completed, but preliminary results are encouraging.

An examination for mastitis of a large number of milk specimens revealed that Staphylococcus aureus was the most important causal organism of this disease. Inspections in loco on farms where mastitis is a serious problem established that poor management is largely responsible. Therapy on these farms is ineffective and culling is done injudiciously.

The efficacy of four live and two inactivated vaccines against brucellosis was compared in guinea-pigs, following standard procedures. The comparison showed
that the live vaccines, which include the Onderstepoort Strain 19 vaccine, provide better immunity that the inactivated vaccines.

**Protozoal diseases**

In a comprehensive study on the epidemiology of the tick-borne disease redwater the serological tests used for the purpose have been perfected and important observations have been made.

It is clear from these studies that, in the Transval and adjacent parts of the Orange Free State and the North-Western Cape, there are areas which differ radically with regard to the epidemiology of the two types of redwater which occur in South Africa. Recommendations based on this knowledge can now be made with reasonable confidence to individual farmers regarding the best measures to adopt to control redwater in specific areas.

It is now evident that there are at least three, and not merely two, *Theileria* spp. of cattle in South Africa, namely *T. lawrencei*, which causes Corridor disease, *T. mutans*, which is apparently not of any economic importance, and a *Theileria* sp. whose pathogenicity is still unclear.

*T. mutans*, like heartwater, is transmitted by the bont tick and may possibly be used as an indicator of the extent to which heartwater is being transmitted naturally on a farm, seeing that a good serological test for *T. mutans* infection has been developed, while there is no comparable test for heartwater.

**Infertility and venereal diseases**

Further research work has been carried out on the isolation and identification of pathogenic microorganisms from bovine fetuses and afterbirths originating from farms where abortions occur. The following table gives an analysis of the findings:

<table>
<thead>
<tr>
<th>Pathogen</th>
<th>77/78 % Infected</th>
<th>78/79 % Infected</th>
</tr>
</thead>
<tbody>
<tr>
<td>Brucellosis</td>
<td>21</td>
<td>14,5</td>
</tr>
<tr>
<td>Q fever</td>
<td>0,8</td>
<td>2,9</td>
</tr>
<tr>
<td>Campylobacteriosis (=vibriosis)</td>
<td>6,8</td>
<td>2,9</td>
</tr>
<tr>
<td>Chlamydiosis</td>
<td>4,5</td>
<td>5,9</td>
</tr>
<tr>
<td>C pyogenes</td>
<td>3,0</td>
<td>1,7</td>
</tr>
</tbody>
</table>

Much research was devoted during the year to the cause of the so-called "epivag" syndrome. During visits to various farms where "epivag" had been reported, affected cows and bulls were clinically examined and specimens collected. Although a variety of agents were isolated, including *Actinobacillus seminis*, *Corynebacterium ovis*, *C. pyogenes*, *Chlamydia psittaci*, IPV virus and mycoplasmas, it was still not possible to produce the "epivag" syndrome with these isolates in the laboratory and the cause of the disease remains a mystery.

**External parasites**
Research in connection with the control of black flies (Simulium spp) by means of water manipulation have produces further interesting data.

 Interruption of the Vaal River for 48 hours at the Barrage had no effect on the midge population in the Parys-Orkney district because the numerous branching tributaries below the Barrage did not drain in time.

 Closure at the Warrenton weir likewise had little effect on the midge plague at the Vaalhartz Scheme because the flies were breeding in the canal system below the weir. On the Orange River, however, closure of the river at the P.K. le Roux and Boegoeberg Dams had good results downstream for fully 400 km.

 The investigation by means of tests on both larvae and adult ticks into the phenomenon of resistance of ticks to dips showed inter alia that field resistance to camphechlor, dioxathion and quinthiophos was still found in blue ticks from time to time, but the majority of blue and other tick species were still controlled adequately if the dips were used at the recommended strength.

 Resistance by tick species other than blue ticks is usually absent or at such a low level that it does not present a practical problem.

 In the research work on the possible use of suspensions of infected ticks as a vaccine against heartwater it was found that bacterial infection in nymphal suspensions could be controlled without detriment to the heartwater organism and, moreover, the organism itself remained comparatively stable during freezing and thawing.

 The experiment in which the duration of immunity after inoculation of heartater blood was determined established that cattle were still immune where challenged 3, 6 and 12 months after inoculation. At 24 months, 2 out of the 15 animals challenged showed slight febrile reactions at the expected time, but their blood was not capable of infecting sheep and they recovered without treatment. Fourteen (70%) out of the 29 controls reacted to challenge, a clear indication that the Onderstepoort heartwater vaccine provides cattle with longer immunity than was previously supposed.

 **Internal parasites**

 Research on *Parafilaria* infestation (false bruising) in heifers and oxen established that the adult parasite lived for about a year, but that the oviposition periods were very much shorter. Re-infestation must therefore take place every year to enable the life cycle to be continued.

 When all the cattle on the Soutpan Experimental Farm were treated with nitroxynil, and the treatment was repeated after an interval of six months, following previously defined regimens, bleeding points in indicator animals disappeared for all practical purposes.

 However, despite the fact that the possibility of transmission was consequently restricted to a minimum, the re-infestation of young animals was not prevented during the next transmission season in the following spring. It is not possible, therefore, to clear a single farm in a *Parafilaria*-infected area by means of therapy.
Poisoning

Pesticides remain one of the commonest causes of animal poisoning. If strychnine is disregarded, approximately half of all cases of animal poisoning investigated by the Institute during the past year could be ascribed to injudicious or negligent exposure of animals to pesticides.

Parathion (an organophosphor pesticide) and dieldrin and thiodan (chlorinated hydrocarbon pesticides) were responsible for most deaths.

The incidence of poisoning of ruminants with urea is still unnecessarily high; 12% of all poisonings (apart from strychnine poisonings could be attributed to the injudicious use of urea in rations and licks.

DISEASES OF SHEEP AND GOATS

Bacterial diseases

There are good grounds for assuming that the important pathological condition among sheep known as "redgut", which occurs in sheep ranging on intensive pastures, especially Lucerne, is caused by *Clostridium perfringens* Type A.

An attempt is being made to develop a vaccine against the disease and preliminary tests on quinea-pigs have shown promising results.

Viral diseases

As the world reference centre for bluetongue, the Institute has rendered valuable service to Reunion, Brazil and Argentina. Types 2 and 4 of the bluetongue virus have been confirmed in the cattle population of Reunion, but only Type 2 has so far been transmitted to the sheep population, in which there has been some mortality.

Serum specimens form sheep received from Brazil contained antibodies against Type 1 of the bluetongue virus, but similar specimens from Argentina, taken from sheep with bluetongue-like symptoms, proved negative.

Representative strains of 15 out of the 20 known serotypes of bluetongue virus were purified and tested for safety and immunogenicity in sheep. The preliminary results were so promising that a new bluetongue vaccine consisting of a series of three injections was recently released for use.

The epidemic of Rift Valley fever which hit South Africa so badly a few years ago made imperative the development of an inactivated vaccine for immunizing pregnant ewes and cattle. An effective new vaccine was developed, but certain questions which arose during the outbreak regarding the interaction between the existing, attenuated vaccine and the new vaccine had to be answered.

It was established that the administration to sheep of the inactivated vaccine during an outbreak did not adversely affect the subsequent use of the attenuated vaccine. The later vaccine, however, was necessary to ensure lifelong immunity.
Furthermore, it was confirmed that the administration of the attenuated vaccine to pregnant sheep caused growth abnormalities in unborn lambs.

<table>
<thead>
<tr>
<th>Diseases</th>
<th>Percentage of farms infected</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>77/78</td>
</tr>
<tr>
<td>Chlamydia</td>
<td>9,3</td>
</tr>
<tr>
<td>Q fever</td>
<td>2,3</td>
</tr>
<tr>
<td>Vibriosis</td>
<td>0</td>
</tr>
<tr>
<td>Chlamydia</td>
<td>16,6</td>
</tr>
</tbody>
</table>

Infertility and venereal diseases

The following are the results of a routine investigation for pathogenic microorganisms in fetuses and placentas of sheep and goats that were either brought or sent to the Institute.

Internal parasites.

Special attempts are being made to supply agricultural co-operatives, which are important channels for the distribution of worm remedies, with general information on the proper use of these drugs.

The Division of Veterinary Services, the Division of Agricultural Information and the Veterinary Research Institute at Onderstepoort have distributed a comprehensive brochure on the control of internal parasites, which was compiled during the year, not only to all agricultural co-operatives serving the livestock industry but also as widely as possible among farmers and other interested persons.

Poisoning

Considerable progress has been made with the project investigating the relationship between facial eczema and geeldikkop. The research work was carried out at Middelburg, Cape, in conjunction with the Division of Veterinary Services and the Plant Protection Research Institute.

DISEASES OF PIGS

Viral Diseases

Good progress has been made with the serological survey of African swine fever in wild animals. Swine fever occurs in at least one area which was previously regarded as "free", namely the Mkuze Game Reserve, where the presence of the disease was confirmed by the isolation of the virus from tampans (Ornithodoros) taken from warthog burrows).

Tests carried out on sows have shown that parvovirus plays an important role in reproductive disturbances of pigs. Ten out of the 14 pregnant sows infected with the virus either aborted or resorbed the fetus. Indications have been found that the virus causes less damage if infection takes place late in pregnancy. Since there is every
indication that this virus plays a very important part in the pig industry, attempts will be made to develop a vaccine to counter it.

**Infertility and venereal diseases**

The survey on the causes of abortions and infertility in pigs is making steady progress. There is no indication so far that dangerous infections, such as Aujeszky's disease and brucellosis, which are found in Europe and the USA, are present in this country.

**DISEASES OF POULTRY**

**Viral diseases**

A kitherto undiagnosed disease of turkeys in the Krugersdorp district, involving thousands of birds and a mortality figure of up to 54% in certain flocks has been attributed to a flavi virus isolated from the turkeys. This virus is possibly either related or similar to a meningoencephalitis virus described in Israel. The virus can be grown in cell culture and the possibility of producing a vaccine is the subject of a current investigation.

There has been considerable improvement in the diagnosis of infectious bronchitis of fowls following the correct application of two techniques in use overseas. One is the haemagglutination test. The other, the technique of direct isolation of the virus in embryonated eggs, has been made much more sensitive by an improved method. With this technique it is possible to demonstrate the presence of the virus in infected fowls within two days, even after a single passage.

**DISEASES OF HORSES**

**Protozoal diseases**

Tests for dourine were carried out on 3 631 specimens form the Republic during tye year, 42 (1,2%) of which were positive. The distribution of these cases was as follows: Transvaal 12, Natal 17, Cape 13.

Positive specimens were also received from Bophuthatswana, Botswana, Lesotho, Transkei and Zimbabwe-Rhodesia.

**DISEASES OF MISCELLANEOUS ANIMALS**

**Viral diseases**

Promising results have been obtained in a field trail with cattle immunised by menas of an experimental rabies vaccine propagated in tissue culture. The same vaccine has also produced promising results in immunised dogs. The vaccine will probably be released shortly for general use.
Of the 767 specimens tested for rabies during the year, 218 (28.4%) were positive, 147 of them from the Republic and 71 from South-West Africa/Namibia.

**Preparation of culture media**

More slaughtering was done at the Institute's abattoir than ever before and its capacity was again taxed to the limit. For example, 1,012 cattle, 89 horses and mules, 1,194 sheep and goats and 4,745 fowls were slaughtered. Most of the meat and specific organs were used for the preparation of culture media for vaccine production and research; the balance was used chiefly for rations.

**TECHNICAL RELATIONS WITH OTHER COUNTRIES**

**Liaison and co-operation with African countries**

Five scientists or officials from African countries and nearby islands, namely from Lesotho, Mozambique, Zambia and Reunion, visited the Institute during the year.

Various neighbouring states received 6,877,743 doses of vaccine through official channels. The Institute also received 1,129 specimens for diagnosis from countries such as Botswana (276), France (7), Israel (46), Lesotho (33), Malawi (8), Mauritius (16), Oman (8), South West Africa/Namibia (429), Swaziland (173) and Zimbabwe-Rhodesia (133).

**Liaison with overseas countries**

Thirty scientists paid short visits to Onderstepoort during the year under review. In addition, 172 foreign tourists visited the Institute in various groups.

As the world reference centre for bluetongue and horsesickness, Onderstepoort was able to render valuable assistance to Reunion, Brazil and Argentina with the diagnosis of bluetongue and the identification of strains of the virus that occur in those countries.

**VACCINES AND STOCK REMEDIES**

**VACCINE PRODUCTION**

As in the past, a significant proportion of the total production was supplied to foreign countries direct. If the issues to South-West Africa/Namibia are included, this proportion amounted to approximately 5%. The income from these sales was nearly R189,000. Details of the doses supplied are as follows:

<table>
<thead>
<tr>
<th>Country</th>
<th>Doses</th>
</tr>
</thead>
<tbody>
<tr>
<td>Botswana</td>
<td>339,473</td>
</tr>
<tr>
<td>Lesotho</td>
<td>4,000</td>
</tr>
</tbody>
</table>
In addition to the above, a quantity of vaccine was also supplied to foreign countries through private trade channels.

### Bacterial vaccines

The most important improvement in bacterial vaccine production was the development of an effective technique for the production of *Campylobacter (Vibrio) fetus* vaccine, which enabled the Institute to meet the demand for this product.

Certain problems regarding the immunisation of young lambs against enterotoxaemia are being investigated, and experiments aimed at improving the botulism and quarter evil vaccines are under way.

### Virus vaccines

There was an increased demand for both rabies vaccine for cattle (HEP) and infectious bronchitis vaccine for poultry. However, the demand for vaccine against most of the insect-borne diseases (e.g. ephemeral fever, Wesselsbron disease and lumpy skin disease) as well as the demand for live Rift Valley fever vaccine and poultry vaccines generally decreased.

### Protozoal and rickettsial vaccines

Issues of anaplasmosis vaccine decreased from 643 660 to 496 530 doses and those of besnoitiosis vaccine from 104 110 to 71 570 doses, but issues of redwater blood increased from 104 185 to 124 145. The demand for heartwater blood also continued its upward trend.

### Antigens

A further marked increase in the demand for bovine and particularly avian tuberculin can be ascribed to more intensive testing for tuberculosis by the Division of Veterinary Services.

### Antisera

In addition to the existing botulism antitoxin, a tetanus antitoxin was made available and has proved to be a useful addition to the series of products provided by the Institute.
Vaccine Doses issued

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Bacterial vaccines</td>
<td>86 467 030</td>
<td>91 611 402</td>
<td>84 334 834</td>
</tr>
<tr>
<td>Virus vaccines</td>
<td>71 735 195</td>
<td>78 254 945</td>
<td>69 054 464</td>
</tr>
<tr>
<td>Protozoal and rickettsial vaccines</td>
<td>1 034 206</td>
<td>970 503</td>
<td>814 555</td>
</tr>
<tr>
<td>Total for all vaccines</td>
<td>159 236 431</td>
<td>170 836 850</td>
<td>154 203 853</td>
</tr>
</tbody>
</table>

Diagnostic antigens (ml)

- 194 011
- 223 911
- 339 107

Antiserum (ml)

- 1 387

DIVISION OF VETERINARY SERVICES

As a result of drought conditions prevailing over most of the Republic there were no major outbreaks of epizootic diseases except for outbreaks of foot-and-mouth disease.

These outbreaks were caused by the SAT II strain of the virus. The necessary control measures were immediately applied. These included the re-vaccination of susceptible animals in the threatened areas as well as on infected farms. Some of the epithelium from lesions from infected cattle was forwarded to the foot-and-mouth disease vaccine production laboratory in Botswana, which was prepared to produce a vaccine made from the relevant SAT II Strain.

*Enzootic bovine leucosis* was diagnosed in two bulls from an AI Station in Natal. Both bulls came from the same farm.

*The bovine tuberculosis* eradication scheme is making rapid progress, especially since the introduction of the diagnostic herd testing scheme. The number of tuberculin tests carried out this year amounted to 4 468 785, and of these tests 484 112 were carried out by officers of the Division. The number of herds tested under the diagnostic scheme was 2 352 (compared to 577 herds the previous year), comprising 329 361 head of cattle.

The number of tuberculosis-free certificates issued to tuberculosis-free herds in accordance with the accreditation scheme was 4 336, which is an increase of 12,8% over last year's figures.

Certain areas in the Western Cape are now free of tuberculosis and legislation which will make the testing of all herds in a defined area compulsory is being prepared.

A total of 217 sheep succumbed to *pulmonary adenomatosis* (jaagsiekte). Deaths were recorded mainly from the Western Cape. An experimental vaccine was used in flocks in the Lydenburg veterinary area.

The total number of herds accepted for *brucellosis* accreditation increased from 700 last year to 1 040 this year and 84 170 head of cattle were involved.

The number of brucellosis-free certificates issued increased from one in the previous year to 88 this year. Under the diagnostic scheme 2 956 herds, comprising 184 202 animals, were tested.
With the increase in outbreaks of sheep scab during the year under review it was decided, in co-operation with Organised Agriculture, that a single dipping of all sheep during the period 1 October 1979 to 31 January 1980 should be made compulsory. Legislation was prepared and a variety of pamphlets dealing with the control of sheep scab were distributed among farmers.

**VETERINARY RESEARCH**

**Miscellaneous research projects**

The AI and Reproduction Section investigated the possible effect of treatment of *Trichomonas*-infected bulls with IPZ and IPZ plus antibiotics on the spermiogram of bulls. They came to the conclusion that neither treatment had any effect on the spermiogram of bulls.

The Poultry Diagnostic and Extension Services Section, in collaboration with scientists at Onderstepoort, devoted considerable attention to the turkey rhinitis/sinusitis syndrome and successfully isolated the causative virus. Indications are that the virus is probably an influenza virus.

A disease of turkeys called turkey meningoencephalitis, which had hitherto been described only in Israel, was diagnosed in turkeys which showed nervous symptoms and a drop in egg production.

It was also shown that cases of ascites in fowls, formerly attributed to heart failure, could be reproduced experimentally by feeding toxic levels of furazolidone.

A fluorescent antibody technique for infectious bronchitis was developed during the past year. With this technique an diagnosis of infectious bronchitis can be made within two days, whereas the virus isolation technique previously used took up to 3 weeks before a diagnosis could be confirmed.

The survey on lung lesions in pigs revealed that inadequate ventilation, overcrowding or overventilation are predisposing factors in the presence of which *Mycoplasma* species may cause explosive outbreaks. Of the 18 474 pig carcases examined, 19.8% showed lung lesions.

In continuing investigations on the causes of swine dysentery, *Treponema hyodysenteriae* has been isolated. In the treatment of this disease it was found that water medication is definitely superior to medicated feeds.

The mastitis control scheme launched by the Alberton laboratory continued to expand and 50 new herds were added to the scheme, bringing the total to 98 herds.

Research was also carried out on mineral deficiencies in animal feeds or grazing. It was decided to concentrate on blood analyses and analyses of the grazing or rations and to compare these with the actual requirements of the animal.
The Middelburg regional veterinary laboratory conducted experiments in order to develop and test a specific immune serum for the detection of pregnancy in ewes from day 6 to day 10. Some success was attained.

In conjunction with the Veterinary Research Institute, experiments on the aetiology of "geeldikkop" were continued. A major breakthrough was achieved in the extraction of the toxic fraction present in *Tribulis* terrestris.

It was proved last year that enzootic icterus was caused by chronic copper poisoning. Attention has this year been given to methods of treatment and prevention. It was found that zinc sulphate was as effective as sodium molybdate in preventing the disease and was in addition much cheaper.

**Research on game and diseases of game**

The activities of the veterinary investigation centre in the Kruger National Park were primarily directed towards foot-and-mouth disease control and research.

The buffalo cow which aborted last year after being artificially infected with a buffalo strain of *Brucella abortus* this year gave birth to a live calf.

Research done on anthrax by the research section of the Parks Board indicated that impala dosed with anthrax spore vaccine can survive if challenged artificially with a lethal dose of virulent kudu strain anthrax spores and become carriers of this disease. It was also found that vultures can act as carriers for the disease for at least 8 days following ingestion of infected meat.

Screening tests on different species of animals in the Kruger National park were carried out to determine the host range of *Trichinella spiralis* in free-living wild animals. Two lions and one leopard were positive. It appears that trichinosis has predominantly a predator cycle in game animals.

Cropping of game during the year under review gave an excellent opportunity to study external and internal parasites of these species.

Internal parasites are listed below. *Nemastrongylus calcaratus* (lungworm) was found in the lungs of impala, nyala and blesbuck. *Cordophilus sagittus* (heartworm) was recovered from the heart of kudu.

*Fasciola hepatica* (liver fluke) Species infected were impala, nyala, blesbuck and blue wildebeest. *Stilesia hepatica* (liver tapeworm) was found in the livers of impala, nyala and blesbuck. *Cysticercus tenuicollis* (bladder worm) was found in springbuck, blesbuck and impala. *Cysticercosis* (measles) was found in impala, nyala and wildebeest carcases. A pelvic nematode which has not yet been identified was found in 80% of all springbuck shot in SWA. External parasites found on game carcases included *Strobilostomum clarkii*. All the rhea shot in Colesberg district were found to be infested. A few springbuck from Prieska were also infested.

**VACCINES AND ANIMAL REMEDIES**
The following vaccines were produced by State veterinarians, veterinary laboratories and/or Regional veterinary laboratories:

<table>
<thead>
<tr>
<th>Vaccine</th>
<th>Quantity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Heartwater</td>
<td>9,242 doses</td>
</tr>
<tr>
<td>Autogenous wart</td>
<td>10,732 millilitres</td>
</tr>
<tr>
<td>Contagious pustular dermatitis (orf)</td>
<td>7,597 doses</td>
</tr>
<tr>
<td>Actinobacillus ligneresi</td>
<td>160 doses</td>
</tr>
</tbody>
</table>

The Regional veterinary laboratory at Stellenbosch prepared 2,100 ml leptospirosis antigen, and 849.3 ml of antigens, 106.0 ml of amboceptor and 866.2 ml of complement were prepared by the Regional veterinary laboratory at Middelburg (CP). The Regional veterinary laboratory at Allerton prepared 16,766 solid and 16,231 fluid media.

**CONTROL OF ANIMAL DISEASES**

**NOTIFIABLE DISEASES**

**Foot-and-mouth disease**

Outbreaks of foot-and-mouth disease occurred in the Gazankulu and Venda homelands. All the outbreaks were caused by SAT II.

Control measures were immediately applied, such as a total embargo on the movement of cloven-hoofed animals or their products, the isolation of the infected area through cordons and the vaccination of infected animals on infected farms and also susceptible animals on adjoining farms.

Due to the smuggling of cattle, small stock and even meat from Zimbabwe-Rhodesia across the Limpopo to Venda, a cordon was established along the Limpopo buffer zone fence which runs parallel to the Limpopo river. This cordon was established even before the outbreaks occurred.

With the outbreak of foot-and-mouth disease in Gazankulu and Venda, further inoculations were carried out using Burroughs Wellcome inactivated vaccine which included strains SAT I, II and III. In all 50,852 head of cattle around the original infection at Malamulele were vaccinated. From 7 to 11 May 1979 all cattle (7,104) in the infected dipping tank areas were inoculated with live virus and day and night patrols on the inner cordon were maintained.

**Rabies**

Of the 728 specimens submitted to the Veterinary Research Institute by the Division of Veterinary Services and the Black States, 225 (29.5 per cent) were positive for rabies. In the previous year 747 cases were reported of which 22.9 per cent were positive.

The eradication of jackals on farms seems to be the best solution. In the Johannesburg area two cases among meercat were diagnosed and an intensive campaign of poisoning with phostoxin tablets was implemented.
Control of this disease depends on the yearly inoculation of all dogs in the proclaimed areas of Natal and parts of the Northern and Eastern Transvaal.

In all 108,442 dogs and 6,323 cats were immunised against rabies by officers of the Division of Veterinary Services. Immunisation was also done in the Black states, where 47,873 dogs and 406 cats were inoculated.

**Anthrax**

Five outbreaks occurred during the year under review. After an absence of many years anthrax made its appearance in the Free State part of the Highveld Region and the Free State Region. Mortality caused by the outbreaks amounted to 36 cattle, 16 pigs and one sheep.

The outbreak among red hartebeest in the Kimberley district which was mentioned in the previous report is now under control.

As a general preventive measure and also during the outbreaks the officers of the Division of Veterinary Services inoculated 4,309,120 cattle, 11,104 head of small stock, 30 pigs and 42 horses. In the Black states 1,825,689 cattle were immunised as a preventive measure by officers of the various veterinary services.

**Tuberculosis**

For the first time since the inception of the tuberculosis eradication scheme, there are more than a thousand farmers in each of two regions of the Division of Veterinary Services that can boast of tuberculosis-free herds. The Western Cape Region passed this milestone in November 1978, the Highveld region accomplished it on 1 December 1978.

The good progress made in the Western Cape Region has acted as an incentive for the Division to give serious consideration to the total eradication of bovine tuberculosis in that region. The necessary legislation for the compulsory testing of all animals in this region has already been drawn up. During the year under review 4,336 (3,843) certificates were issued to tuberculosis-free herds, and 6,033 (5,207) herds participated in the eradication scheme. Since the initiation of the scheme 854 (748) previously infected herds have now qualified for tuberculosis-free certificates.

**Bovine brucellosis** (*Brucella abortus*)

The number of heifers, over the age of three months but still under the age of 11 months, inoculated during the year under review with Strain 19 vaccine in White areas either by or under the supervision of officers of the Division of Veterinary Services amounted to 575,443. The number vaccinated in Black States was 93,464.

Where infection is confirmed in a herd, written permission can be obtained from the local State veterinarian for the inoculation of females over the age of 11 months. In
this way 6 058 (9 188 - 1977/78) females were vaccinated during the year. The voluntary accreditation scheme has shown remarkable growth during the year under review. A total of 1 040 herds comprising 84 170 cattle joined the scheme. A total of 88 brucellosis-free certificates was issued.

The diagnostic scheme which was launched on 1 July 1977 has made excellent progress. A total of 184 202 animals from 2 956 herds were tested. Of these 1 344 herds (45,4%) and 10 387 (5,6%) cattle were positive.

Trypanosomiasis

Nagana

During November 1978, a single suspected case of trypanosomiasis (T. congolense) was found in a horse in the Mkuze game reserve. A subsequent survey suggested that a flare up of the disease is unlikely at this stage.

The control of tsetse flies in the Caprivi is now the responsibility of the Division of Veterinary Services in South West Africa/Namibia.

Dourine

Of the 3 443 samples tested by the Veterinary Institute and other Regional veterinary laboratories 55 (1,6%) were positive.

Lumpy skin disease

Outbreaks occurred throughout the Republic except for the Western Cape Region. The incidence was low except in the Natal and Transvaal Regions.

Officers of the Division of Veterinary Services inoculated 69 685 head of cattle against the disease. Three hundred and seventy-eight animals were inoculated in Qwaqwa and 49 672 in Lebowa.

Sheep scab

The number of outbreaks increased from 320 in 1977/78 to 351 in the year under review. Preparations were made for compulsory dipping, which will start on 1 October 1979 and last until 31 January 1980.

A sheep scab liaison committee was also formed to deal with certain problems. All interested parties are accommodated in this committee.

Legislation was prepared for the compulsory dipping of all sheep in the Republic of South Africa. Neighbouring states were also contacted in order to bring their dipping program in line with that of the Republic.
Pamphlets dealing with the economic importance of sheep scab, the methods of dipping and the erection of dipping tanks were distributed among farmers. Additional expenditure of R920 000 for this campaign was approved by the Treasury.

In all 806 047 head of small stock, 89 601 of which were in the Black States, on infected or contact farms, were dipped at least twice.

Mange

Sporadic cases of cattle mange were observed in all the regions except in the Higveld and Transval Regions, where the incidence of the disease was high, especially among dairy cattle. Pig mange was a common problem in all the regions and also in Lebowa, Gazankulu and Venda. With the advent of new dipping compounds this problem can now be solved.

African swine fever

Three outbreacks of African swine fever occurred in the swine fever control areas. One outbreak involving 9 pigs occurred on a farm in the Thabazimbi district. Swine fever control measures are still being employed as before.

Swine erysipelas

The disease occurred in all the Regions of the Division and there were 32 outbreaks in all. Administration of antibiotics, together with improved hygiene and preventive inoculation, effectively controls the disease.

Infectious laryngotracheitis

An outbreak which occurred near Johannesburg caused fairly extensive mortality in a broiler flock. Follow-up investigations appeared to indicate that infection was fairly common with a virus which was of low virulence but which was capable of causing problems when complicated by other debilitating conditions or respiratory ailments. This disease can be combated by immunising fowls at the age of 2 weeks.

Newcastle disease

Isolated outbreaks occurred in the Transvaal, Natal, Eastern Cape and Karoo and Northern and Eastern Transvaal Regions. Sporadic outbreaks occurred in Venda, Gazankulu and Lebowa. Compulsory vaccination of fowls in Lebowa was stopped and farmers now do their own inoculations. A total of 66 256 fowls were vaccinated.

NON-NOTIFIABLE DISEASES

Bacterial diseases

Mastitis
In the Natal Region the Mastitis Control Scheme continued to expand and 50 new herds were added to the scheme during the year, bringing the total membership to 88 herds.

A study group was formed in the Western Cape Region under the leadership of the State Veterinarian of Mossel Bay to deal more effectively with all aspects of this disease. The extension officer as well as all veterinarians in private practice have been included in this study group.

In KwaZulu mastitis was caused mainly by tick bites. With the use of a new dipping compound there was a marked decrease in the incidence of mastitis.

**Enterotoxaemia (pulpy kidney)**

As a result of the drought conditions of the OFS Region farmers have been forced to feed their sheep emergency rations and the resultant alteration in ruminal flora has caused an increase in the incidence of the disease. It is also estimated that only 20% of farmers inoculate against enterotoxaemia.

It is reported from the Eastern Cape and Karoo Region that there are indications that the oil-emulsion vaccine is not providing satisfactory immunity.

**Black quarter**

Except for the Western Cape Region, where sporadic cases occurred in the Mossel Bay veterinary area, this disease was rife throughout the other regions of the Republic. The occurrence of this disease is mainly due to the neglect of farmers to immunise their cattle timeously.

The fluorescent antibody technique employed by the Regional veterinary laboratories and other veterinary laboratories has enabled the officers of the Division to distinguish between the causal organisms, thereby making it possible for the Veterinary Research Institute to provide specific vaccines to control such outbreaks.

**Botulism**

An antitoxin was developed by the Veterinary Research Institute at Onderstepoort for use as an aid in the treatment of early cases of botulism in horses, cattle, sheep, chickens and waterfowl.

**Corynebacteriasis**

This disease was widespread throughout the Republic, in cattle as well as sheep.

Spinal abscesses in lambs have been reported from the OFS Region after tail docking.

The abscesses occurred mainly in the lungs and livers. In calves the infection was mainly confined to the joints. In the Eastern Cape and Karoo Region the infection is commonly associated with shearing wounds and bad hygiene in shearing sheds. In the East London State veterinary area the mass infestation of the head and ears of
goats mainly by the tick *Rhipicephalus appendiculatus* causes meningeal and hypophyseal abscessation.

It was found that the available vaccines are not correctly used.

**Pasteurellosis**

This disease was encountered throughout the Republic in cattle as well as small stock.

In the Transvaal Region blue udder in sheep was in some cases the sequel to infection with this organism.

Anaphylaxis following inoculation with *Pasteurella* vaccine caused the deaths of 3 calves, 7 goats and 3 adult cattle in the OFS Region. Calf rearing units were affected in the Western Cape Region.

**Tetanus**

In practically every case reported the elastrotor rubber ring, which is used for castrations and docking the tals of lambs, was involved.

An antiserum, for the treatment of early cases of tetanus in horses, cattle, sheep and dogs, was made available by the Veterinary Research Institute.

**Colibacillosis**

In the Northern and Eastern Transvaal Region mortality was high in two piggeries until the *E. coli* vaccine was used. Seven young elephants kept in captivity in the Kruger National Park died of colibacillosis.

Deaths occurred in high density calf and pig rearing units in the Western Cape. Poor housing and management were responsible for the condition developing. With improved management and the use of the Onderstepoort vaccine this disease can be combated.

**Leptospirosis**

A total of 3 500 doses of *Leptospira Pomona* experimental vaccine were issued to the three piggeries where outbreaks of this disease had occurred. The vaccine gave very promising results.

**Strangles**

A severe outbreak of strangles involving 50% of the horses at a riding school occurred in the Natal Region. With suitable treatment all the horses recovered.

**Protozoal diseases**

**Babesiosis**
This disease was prevalent in all the Regions. In the Natal Region it was one of the most important disease.

There was a dramatic decrease in mortality among cattle in KwaZulu due to the use of a new acaricide. In certain areas where the dipping of cattle was interrupted when the dippin tanks had to be used for sheep scab control there was an immediate increase in the number of cases of redwater.

**Anaplasmosis (gallsickness)**

The disease is probably the most common disease of cattle in the Highveld Region. Officers of the Division inoculated 4 561 head of cattle.

In the Natal Region the vaccine is used extensively. The State Veterinaria at Vryheid reported 145 outbreaks involving 283 cattle, however.

**Virus diseases**

**Bluetongue**

A total of 34 deaths were reported from the Highveld Region. Officers of the Division assisted farmers in inoculating 21 075 sheep.

In the Western Cape it is estimated that 85% of the farmers inoculate their sheep against this disease.

**Heartwater**

In the Highveld Region the disease has become established in the Marico district, where a farmer lost 34 head of cattle during the year under review. The usual drugs used against heartwater are not having any effect in curbing this disease in this specific district.

Officers of the Division assisted farmers in inoculating 1 353 cattle.

Heartwater caused heavy losses among cattle, sheep and goats in Lebowa, KwaZulu, Venda and Gazankulu. The heartwater problem can be partially solved by making use of heartwater blood.

**Bovine malignant catarrh**

In the 6 outbreaks which occurred in the Natal and Transvaal Regions there had been contact with blue wildebeest.

**Infectious ophthalmia**

The disease was widespread throughout the Republic except for the Northern and Eastern Transvaal Regions.

The State Veterinarian, Bloemfontein estimated that 20% of calves in his area were affected.
In the Karoo Midlands chlamydial organisms were demonstrated in conjunctival smears of infected as well as a percentage of non-infected sheep.

**Contagious pustular dermatitis (vuilbek, orf)**

Autogenous vaccines were prepared at the Middelburg, Queenstown and Grahamstown laboratories. This vaccine gives excellent results if administered timeously.

**Infections bovine rhinotracheitis**

Isolated cases were reported from feedlots in the Pretoria, Vrede and Ermelo districts.

Blood samples from two herds in the Queenstown veterinary area with the suspected IPV form of the disease were found positive at the Veterinary Research Institute, Onderstepoort.

**Enzootic bovine leucosis (EBL)**

As a result of a suspected case of *enzootic bovine* leucosis in a bull from an AI Station in Natal the animal concerned was slaughtered and autopsied.

The diagnosis was confirmed on histological findings by the Veterinary Research Institute at Onderstepoort.

**Vibriosis**

The disease was diagnosed in all the Regions. An examination of sheath washings of 3 695 bulls showed that 123 (3,3%) were positive for vibriosis. There is a vaccine available which, if correctly used, will control this disease.

**Trichomoniasis**

Trichomoniasis infection of bulls was diagnosed in all the Regions as a cause of reproduction failures. Sheath washings of bulls were examined by the Veterinary Research Institute, Regional veterinary laboratories and veterinary laboratories and 101 out of 3 695 (2,7%) examined were positive for trichomoniasis.

**Actinobacillus seminis**

The Regional veterinary laboratory at Middelburg (Cape) maintains that this disease is responsible for considerable losses to stud farmers, who lose up to 20% of their sale rams as a result of epididymitis caused by this organism.

A total of 4 445 serum samples from sheep in the Western Cape, Eastern Cape and Karoo, Free State and Transvaal Regions were examined for this disease.
It is interesting to note that in the Highveld Region 10 (4.5%) of the 221 sheath washings taken from bulls were positive for *Actinobacillus seminis*. In cows 38 (22.4%) vaginal and/or uterine mucus samples from 170 cows were positive.

**Brucella ovis**

Of the 9,935 samples submitted for examination in the Western Cape and Eastern Cape and Karoo Regions, 746 (7.5%) were positive for *Brucella ovis*. In the Free State Region 4,767 samples were tested and of these 426 (8.9%) were positive.

The relatively high percentage of positive rams indicates that farmers are not making use of the available Rev. 1 vaccine, which gives excellent results.

**Infections epididymitis/vaginitis ("Epivag")**

This disease is far more prevalent than was previously realised. In the Natal Region a diagnosis was made on 45 cows and 1 bull at the abattoir. In the Transvaal Region the condition was encountered in 2 large herds with approximately 750 breeding cows.

The condition was reported to be widespread in the Louis Trichardt State veterinary area.

**Diseases of calves**

**White scours**

This disease occurred in calves throughout the Republic. Good extension work by the Regional veterinary laboratory at Stellenbosch and field staff has brought the incidence down to between 2% and 3%.

Poor hygiene and management were a major cause of outbreaks.

**Entero viruses**

In the Western Cape Region where calves are kept in calf rearing units with an automatically controlled environment mortality following diarrhoea occurred in animals aged 4 to 8 weeks. The mortality rate was as high as 23% and the only pathogen that could be identified in some cases was a Rota virus.

Upon the advice of the Regional veterinary laboratory at Stellenbosch the temperature of 18°C was raised to 21°C and no further deaths occurred. The experimental inactivated Rota virus vaccine used on 6-8 month pregnant cows made no difference to the susceptibility of their progeny.

**Disease of poultry**

The volume of work of the Poultry Diagnostic and Extension Services Section of the Division of Veterinary Services at Onderstepoort showed a marked increase compared to the previous year. This increase can probably be ascribed to more birds being done for specific groups of poultry farmers than to a deterioration in the general health status of poultry in this country.
Fortunately for the poultry industry the incidence of respiratory diseases was low.

**Infectious coryza**

There has been a marked increase in the incidence of this disease, mainly in young pullets 6 to 8 weeks of age in the Natal and Western Cape Regions. Prophylactic vaccination was not always successful.

The practice of infecting vaccinated point-of-lay pullets as soon as they arrived on the farm was sometimes employed.

**Chronic respiratory disease (mycoplasmosis)**

The Poultry Diagnostic and Extension Services Section at Onderstepoort played an important part in helping to control mycoplasmosis by isolating and identifying mycoplasmas from field cases, using the FA test. Just about all the parent flocks of broiler producers are negative for *Mycoplasma gallisepticum*.

**Epidemic tremor**

A few cases were diagnosed in the Natal and Higveld Regions. It would appear that the disease was being controlled by the extensive use of vaccine.

**Diseases of pigs**

**Vibrionic disease dysentery**

For the first time *Treponam hyodysenteriae*, the cause of the disease, was isolated and the organism grown successfully on several media.

**Respiratory disease syndrome**

The above condition was diagnosed on 3 farms in the Natal Region and three new outbreaks were diagnosed by the Regional veterinary laboratory at Stellenbosh. Outbreaks were speedily brought under control by the addition of antibiotics to the rations and by correcting housing faults.

**DEFICIENCY AND NUTRITIONAL CONDITIONS**

Supplementary feeding and the use of stock licks are becoming more popular and fewer problems due to malnutrition were therefore encountered.

In the Bethlehem district urinary calculi developed in rams and hamels that were fed rations too high in phosphates. Ammonium chloride was used successfully in the treatment of some of the cases.

**Manganese deficiency**

At the Potchefstroom College of Agriculture 10% of hamels in an intensive feedlot were affected with bow legs. This was found to be due to manganese deficiency.
The deficiency was also diagnosed on a sheep farm in the Malmesbury district, and in the Kimberley State veterinary area.

Vitamin A deficiency was believed to be involved in outbreaks of abortion amongst Boer goats in the Middelburg (CP) State veterinary area. These abortions ceased after the administration of Vitamin A.

Vitamin E deficiency was confirmed in chickens in the Louis Trichardt and Belfast districts. A multivitamin solution added to the drinking water solved the problem.

POISONING

Mineral poisoning

The usual spate of mortality due to carelessness or accidental intake of poisons was reported from all parts of the Republic.

INTERNAL PARASITES

Owing to the drought conditions that prevailed over most of the country, serious problems with internal parasites were not encountered.

In all the Regions except the Transvaal Region *Haemonchus* spp. (wire worm) was the most common of the parasites that caused problems.

Parafilaria bovicola infestation was diagnosed in the Free State and Eastern Cape and Karoo Regions. It is still a problem in the infected areas of the Natal, Transvaal and Northern and Eastern Transvaal Regions.

Observations in the Transvaal Region seemed to indicate that the regular use of arsenical dipwash was almost able to prevent infection.

EXTERNAL PARASITES

Although not as numerous as in the previous year, problems with tick-borne diseases were still encountered throughout the country. A population explosion occurred among ticks in the Western Cape Region, no doubt because of favourable climatic conditions.

Simulium midges occurred in epidemic proportions on farms bordering on the Vaal, Mooi and Orange Rivers. Breeding was prolific during long periods of constant water flow in these rivers.

Scientists from Onderstepoort estimated that one chemical treatment of the Orange River would cost at least R2 million. When the water levels are lowered the larvae
are exposed to direct sunlight and dessication and soon die. In this way a certain amount of control can be exercised. On the other hand, the irrigation farmers are inconvenienced when their water supply is cut off. Simulium midges can have a devastating effect on livestock. They not only suck blood but also inflict numerous stings which can be so painful as to prevent animals from feeding. Farms as far afield as 30 kilometres from these rivers reported black fly problems.

**ARTIFICIAL INSEMINATION**

The testing of bulls at AI centres in Natal and the Western and Eastern Cape was carried out at the Regional veterinary laboratories at Allerton (Natal) and Stellenbosch (Western Cape) and the veterinary laboratory at Grahamstown. All other AI bulls were tested, as in the past, by the AI and Reproduction Section of the Division of Veterinary Services, in conjunction with the Veterinary Services, in conjunction with the Veterinary Research Institute. During the year under review 232 were tested for this purpose.

At present, there are 64 AI bulls for which progeny testing has been completed. Fifty-six of these are dairy breed bulls.

The total number of doses of semen sold by AI centres during 1978 was 529 718 (529 874 in 1977). Of this number, 393 938 doses were from dairy breed bulls and 135 780 from other bulls. AI centres collected 94 754 doses of semen from 346 private bulls on behalf of their owners.

A total of 15 656 doses of bull semen, 90 doses of sheep semen and 68 doses of pig semen were imported.

**ANIMAL HEALTH EXTENSION SERVICE**

The extension services rendered to farmers by officers of the Division of Veterinary Services are continuing to expand. In addition to the Division's contribution to the training of prospective farmers at agricultural colleges, and the compilation of pamphlets and other literature, the following tasks are undertaken.

Farmers' days are arranged and addressed, articles are published in local papers and agricultural journals, farmers unions and study groups are addressed, radio talks are given, short courses on stock diseases are offered and programmes for vaccination and dosing are drawn up.

Individual farmers are given advice by State veterinarians and stock inspectors on farming and veterinary problems, improved stock farming practices and the advantages to be gained by joining disease eradication schemes, such as the bovine tuberculosis and brucellosis schemes.

**AI Training**

<table>
<thead>
<tr>
<th>Courses offered</th>
<th>Registerable Inseminators</th>
<th>Owner inseminators</th>
<th>Labourers</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Courses</td>
<td>Candidates Passed</td>
<td>Courses</td>
</tr>
<tr>
<td>-----------------</td>
<td>---------</td>
<td>------------------</td>
<td>---------</td>
</tr>
</tbody>
</table>
IMPORT AND EXPORT CONTROL

Import control

To prevent the introduction of stock diseases from other countries, the Division uses quarantine stations for animals and birds at Jan Smuts Airport, Durban, Cape Town and Walvis Bay.

A large variety of animals were imported for various purposes.

Various hunting trophies, 30,55 kg of biltong, 31 kg of meat and 24 insects, which had been brought into the country illegally, were seized and destroyed at Jan Smuts airport.

Export Control

Officers of the Division of Veterinary Services carried out veterinary examinations and issued certificates in respect of numerous kinds of animals intended for export to neighbouring states and overseas countries.

Certificates for a large variety of products being exported were also issued by officers of the Division.

TRAINING

State veterinarians of the Division gave lectures on veterinary science at all the agricultural colleges.

The in-service training of members of the inspectorate staff was continued, and three courses for 71 officials were held during the year. Since September 1972, 596 officers have been trained in this way. In-service training of members of the inspectorate staff in the performance of tuberculin tests in terms of the bovine tuberculosis eradication scheme was continued when 24 officers attended a course. There are now 112 officers capable of performing tuberculin tests on cattle.
TECHNICAL RELATIONS WITH OTHER COUNTRIES

Liaison and co-operation with African countries

Visits were paid to the Head Office of the Division by scientists from Zimbabwe Rhodesia, Transkei and Bophuthatswana.

Liaison with overseas countries

Scientists from New Zealand, Italy, West Germany, Great Britain, Holland and France paid official visits to the Head Office of the Division during the year.

The Regional veterinary laboratory at Stellenbosch was visited by 13 overseas scientists and the veterinary laboratory at Skukuza received 8 visiting scientists. The visitors came from Paraguay, the USA, Australia, France, Great Britain, Italy, Holland, Canada, Switzerland, West Germany and New Zealand.

DIAGNOSTIC SERVICES

A part from diagnostic services rendered by State veterinarians in their own areas, the Division has four Regional veterinary laboratories, at Allerton, Middelburg (Cape), Stellebosch and Windhoek, as well as smaller veterinary laboratories at Grahamstown, Bloemfontein, Queenstown, Kroonstad and Potchefstroom. The additional laboratory at Skukuza enables the Division to keep track of animal diseases occurring among game in the Kruger National Game Reserve. Furthermore the Poultry Diagnostic and Extension Services Section and the AI and Reproduction Section of the Division at Onderstepoort offer a very comprehensive service to poultry and cattle farmers. These laboratories do a great deal to assist State veterinarians and also play an increasingly important part in extension.

There was an increase of 40% in the diagnostic services rendered by the Division.

Distribution of cattle

<table>
<thead>
<tr>
<th>Region or self-governing Black state</th>
<th>White owners</th>
<th>Non-White Owners</th>
</tr>
</thead>
<tbody>
<tr>
<td>Western Cape</td>
<td>373 166</td>
<td>6 297</td>
</tr>
<tr>
<td>Eastern Cape and Karoo</td>
<td>964 250</td>
<td>41 473</td>
</tr>
<tr>
<td>Transvaal</td>
<td>1 990 525</td>
<td>170 271</td>
</tr>
<tr>
<td>Natal</td>
<td>1 271 497</td>
<td>273 391</td>
</tr>
<tr>
<td>Free State</td>
<td>1 688 753</td>
<td>34 296</td>
</tr>
</tbody>
</table>
MEAT HYGIENE

ADMINISTRATION

Abattoirs

According to the register kept by the Chief Meat Hygiene Officer in terms of section 3 of the Animal Slaughter, Meat and Animal Products Hygiene Act, 1967 (Act 87 of 1967), a total of 1 138 abattoirs in the Republic possessed valid certificates of approval on 30 June 1979.

During the year certificates of approval were issued to 42 red meat abattoirs, 23 poultry abattoirs and 2 rabbit abattoirs for the first time.

Certificates of approval were withdrawn from 31 red meat abattoirs, 23 poultry abattoirs and 1 rabbit abattoir, which were then closed for various reasons.

Sterilisation plants

At present there are 98 sterilisation plants registered in terms of Act 36 of 1947 in the Republic of South Africa.

These plants, which produce fish meal, carcase meal, blood meal, bone meal, fish oil and tallow, are inspected at least once a year by State veterinarians for the purpose of either registration or re-registration.

Planning

In accordance with the provisions of section 18 of Act 87 of 1967, the Division of Veterinary Services examined 324 sets of plans for the erection, improvement and extension of abattoirs.

This required detailed written comments and recommendation on 993 drawings.

Meat Imports
A limited amount of low-grade industrial meat was imported from Zimbabwe, Rhodesia and Botswana.

**Meat Exports**

The following quantities of meat were exported during the year:

<table>
<thead>
<tr>
<th></th>
<th>Overseas</th>
<th>Neighbouring countries</th>
</tr>
</thead>
<tbody>
<tr>
<td>Frozen, refrigerated and canned red meat</td>
<td>14 642 tons</td>
<td>5 258 tons</td>
</tr>
<tr>
<td>Meat products</td>
<td>100 tons</td>
<td>330 tons</td>
</tr>
<tr>
<td>Poultry</td>
<td>30 133 tons</td>
<td>1 158 tons</td>
</tr>
<tr>
<td>Game</td>
<td>2 760 tons</td>
<td></td>
</tr>
<tr>
<td>Ostrich meat</td>
<td>128 tons</td>
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**MEAT INSPECTION SERVICES**

**Departmental**

The Division is responsible for meat inspection services at abattoirs belonging to or managed by the Abattoir Corporation, as well as at privately owned abattoirs approved as export establishments. During the year these abattoirs slaughtered:

- Cattle: 1 117 056
- Sheep: 3 004 347
- Pigs: 616 267

**GRAZING UTILISATION RESEARCH**

**NATURAL GRAZING**

**Bushveld areas**

Research on the effect of the chemical control of bush encroachment on the veld and on livestock production was continued. The latest information indicates that the rate of re-encroachment and regrowth is determined by the degree of control obtained initially. Where effective control was obtained, initially. Where effective control was obtained, encroachment appears to be only a minor problem for periods of 10 years or even longer. On the other hand, where there was poor initial control, re-encroachment causes difficulties after only a few years.

Research projects on the yields produced by individual gras species and stock grazing preferences are proceeding. This information is of cardinal importance in the application of controlled selective grazing. These projects revealed that a species such as *Chrysopogon* serrulatus is by far the most palatable, but that *Themeda triandra* and *Cymbopogon plurinodis* are the most productive.

**Karoo areas**

The pasture productivity model developed for Karoo veld is undergoing further testing and refinement as more information becomes available.
An investigation completed during the year under review revealed that a serious problem is developing in the Karoo areas of the Orange Free State Region as a result of the fact that three-thron rhigozum *Rhigozum trichotomum* is spreading and becoming denser. The total area involved is estimated at about 1,166,000 ha.

**Central grassveld areas**

The investigation into the nutritional value of natural veld and the effect of supplementary feeding was continued in the OFS Region. Supplementation was placed directly in the rumen of sheep every day, via rumen cannulas.

The effect of the supplementation is determined by means of parameters such as changes in body mass, wool production in Merinos, voluntary feed intake, selective grazing habits, rumen ammonia concentrations and mineral status (blood and bone) of the sheep. With the exception of rumen ammonia concentrations, no definite effect could be ascribed to the supplementation. This gives rise to the question whether the practice of providing nitrogen and phosphorus supplementation to dry sheep on grass pastures in the Central Orange Free State is efficient and economically justifiable.

The results of a comprehensive investigation in which mutton production was researched under four rotational grazing systems and at two grazing intensities were processed. In the course of the investigation, which spanned seven seasons, it was found that with multi-camp systems and a rapid rotation of camps veld grazing is available for a longer period during dry seasons than where there are fewer camps and the rate of rotation is slow. A part from the greater flexibility of a multi-camp system, none of the multi-camp systems (6, 12 and 18 camps) produced consistently higher animal production than the standard three-camp system. The condition of the veld where the investigation was carried out was relatively good, and the veld varied from subclimax to climax Themeda grassveld. Under the weather conditions that prevailed during the investigation none of the camp systems applied had a significantly adverse or favourable effect on the botanical composition of the veld.

According to the research programme carried out in the dry grass-bush communities of the Eastern Cape, in the majority of cases bush should be regarded not as a threat but as a valuable part of the ecosystem. If browsers are included in the beef production system, red meat production in these communities can be boosted by 50%. Results show that the farm income per R100 of capital investment obtained from a beef cattle/Boer goat production system amounts to R48,94 at present, as against R19,75 from a beef production system.

**High-potential areas**

The application of controlled selective grazing on sourveld at the Athole Experimental Farm over a period of seven years reduced both the period for which it was necessary to supply winter feeding and protein supplementation requirements in autumn.
During the year considerable progress was made with the development and testing of a technique to determine the condition of the veld and the way it is developing. This technique provides a very simple method of describing and monitoring the condition of the veld with a view to adapting the system of management.

**ARTIFICIAL PASTURES**

**Legumes**

Increasing interest was shown in legumes as a source of nitrogen. The programmes in which new introductions and other legumes are being evaluated, particularly for use in the summer rainfall areas, were continued.

Preliminary findings of previous years, namely that cold weather legumes could play a bigger part in the summer rainfall areas, were confirmed by results obtained during the year under review. These crops make good use of autumn rains to provide winter grazing and respond well to irrigation.

Early cultivars such as Ghor and Cyprus *Medicago truncatula* produced 4 to 5 tons of dry mass per ha virtually without irrigation, and serradella *Ornithopus sativus* and subterraneum clover *Trifolium subterraneum* cv. Northam A responded very well to irrigation and produced 16 and 13 tons of dry mass per ha, respectively.

In a field trial on moist soil in the Waterberg area ordinary serradella *O. sativus* established in February produced 8 tons of dry mass per ha without irrigation. Yellow serradella *O. compressus* also appeared very promising.

The multiplication in fields of the seed of pasture legumes in order to supply seed for Departmental research programmes continued. During the year the nurseries at Rietondale were able to supply seed to the Regions for experimental work.

In a yield trial with hot weather legumes a number of vrops were compared at various lime and phosphorus levels. Although the soil was exceptionally sour (pH 4.0 : KCl), none of the species responded to liming. *Macroptilium atropurpureum* (cv. Siratro) and *Stylosanthes guianensis* (cv. Oxley) responded to increased phosphorus levels up to and including 40 kg of P/ha, but *Aeschynomene falcate* (cv. Bargoo) showed no increase in the yield above 20 kg of P/ha. Despite a very dry season, these species survived well and produced satisfactory quantities of seed.

The national lucerne breeding programme produced good results. The development of aid-tolerant Lucerne types showed that if acid-tolerant genotypes are used an increase of up to 40% in the yield can be obtained at lower lime and phosphate fertilising levels. The incidence of aphids was high during the year under review, which made it possible to form a very good idea of the resistance of the local Lucerne breeding material to this insect. In Lucerne cultivar trials with imported cultivars, some imported cultivars which were resistant to aphids produced higher yields than the better adapted local material.

**Grasses**
The evaluation programme with blue buffalo grass *Cenchrus ciliaris* which was being carried out in the Transvaal Region, has now been completed. Sufficient results are available at present to enable recommendations to be made on the cultivation and utilisation of *Cenchrus ciliaris* in most areas.

It was found in the course of an investigation in the Free State Region that there is little difference during the summer months between the digestibility and quality of *Cenchrus* and those of red grass. The carrying capacity of artificial fertilised Cenchrus is four to five times that of the natural veld, however.

After five years' research at Nooitgedacht to determine the relative palatability and the voluntary intake of *Eragrostis* curvula cultivars in the form of hay, it became evident that management (state of cutting, season and level of fertilising) plays a decisive part.

*Eragrostis curvula*/Lucerne mixtures for both hay and grazing produced very promising results during the past season. Under grazing, especilla, a 50:50 mixture produced yields that compared favourably with those produced by a pure grass pasture that had received 200 kg of N/ha.

During the period under review a Phase 1 evaluation of introductions was completed in the subintroduction nursery for the bushveld at Vaalharts. The production of certain *Anthephora* selections compared favourably with that of the best *Cenchrus* introductions. Selection V74/103, with a production of 6,42 ton of oven-dried material per ha and selection V74/105, with a production of 6,32 tons/ha, produced over two-thirds of the average production of the best *Cenchrus* introduction. *Anthephora* is not only more cold-resistant than *Cenchrus*, but also buds earlier in spring. The best *Anthephora* introductions are being transferred to Phase 2.

Kikuyu and annual Italian rye grass are still the most important pasture crops for dairy herds in Natal. The effect of pasture management on the feed flow of these crops was studied in various trials.

Attempts to obtain a twelve-month feed flow from red grass by planting it at monthly intervals produced disappointing results owing to weed problems. However, very promising results were obtained by using red grass pastures as an alternative in feedlots where young cattle are being finished for the Christmas market.

**FEED AND FORAGE CROPS**

**Small grain**

At Bethlehem winter soilage crops were selected for yield and regrowth potential with the purpose of identifying suitable cultivars for pasture production. The crops investigated included various oat, wheat, ryecorn, rye grass and even tuber crops. The highest dry matter production was obtained from the oat cultivars. The winter varieties (decumbent) had the best regrowth potential after grazing. Erect cultivars showed little or no regrowth, chiefly because the growing point had been damaged during defoliation. Severe frost also cause damage, particularly to oats. It became apparent from this investigation that oats is suitable for early winter and spring, whereas crops with better resistance to cold, such as rye and wheat, are
recommended for the middle of winter. Rye grass produces good yields at the end of winter and can more effectively fill the feeding gap between the end of winter and summer.

**Japanese radish**

Further work on this well-known crop, and particularly on the Nooitgedacht cultivar, has yielded reliable production standards for seasonal production and quality where Japanese radish is to be included in livestock enterprises. Fertilising calibration work, which started this season, has shown that a balanced NPK fertilising programme is extremely important. Where one or more of these elements are deficient, the result is often total crop failure rather than merely a reduction in yield.

**Babala**

In a trial in which three overseas babala cultivars *Pennisetum typhoides* were compared with a South African commercial babala in respect of production and chemical quality, the effect of the drought was clearly evident. During the past season Star again produced lower yields than Tamworth, Gahi 3 and SA Standard. The total average dry matter production for the past season was 2.4 tons/ha, however SA Standard produced the highest dry matter yield throughout.

**Cereal legumes**

During the year under review seed of the sweet lupin *L. albus* cv. Ultra was multiplied in fields at Rietondale. A good seed crop was obtained and a considerable quantity was sent to the Winter Rainfall Region for further multiplication. This lupin species has good resistance to mildew *Erysiphe* spp., which virtually wiped out the blue lupin *L. angustifolius* in the winter rainfall areas. Large quantities of Ultra seed were also supplied to other Regions for experimental work.

In a yield trial in which several *Lupinus-*-, *Vicia-* and *Lathyrus* species and the field peas *Pisum sativum arvense* and *Cicer arietinum* were compared for seed yield, *Lupinus albus* cv. Ultra, with a yield of 3.5 tons/ha, did significantly better than all the other entries. The blue lupin, cv. Unicrop, which produced 1 ton/ha less, was the second best entry.