1. THE LIVESTOCK INDUSTRY

BEEF CATTLE

Production trends

There has been a considerable increase in the slaughtering of stock over the past decade in spite of the fact that, in the case of cattle, there was a decrease in the number of live animals. The increase in the slaughtering of cattle 1969/70 to 1970/71 was 12.7 per cent.

During the year under review the Republic imported about 390,000 head of cattle and cattle carcases from South West Africa and other neighbouring territories. These imports have increased dramatically during the past five years [305 per cent] and constitute 14 per cent of all cattle slaughtering in South Africa.

The Republic cannot supply all its own beef requirements. The increase in beef production does not even keep pace with the increase in population.

Changes in the industry indicate that attempts are being made to solve production problems. Crossbreeding is increasing, with consequent higher calving percentage, faster growth, greater mass at weaning, etc. Fast-growing lean-meat types are being used more and more in crossbreeding programmes.

Intensive fattening on a high energy ration is increasing as the gap between maize prices and meat prices shrinks. Intensive patterns of production are becoming more general, and the scale is the most important single factor in attempts to increase meat production effectively.

In the Winter Rainfall Region there are three interesting trends to be observed in the production of beef:

In the first place there is a hitherto unknown interest in the keeping of beef cattle breeding cows and also a real expansion in the breeding of beef cattle. In the second place a large expansion is noticeable in the specialised concerns that finish oxen for the market in feeding pens in the vicinity of Cape Town. It is estimated that 6 to 8 per cent of the cattle slaughtered at the Maitland abattoir during 1971 came from these feeding pens.

In the third place there was a clearly visible expansion in the number of concerns utilising weaner calves for the production of meat from the dairy herd. The experimental work on the early weaning of dairy calves carried out at Elsenburg and Welgevallen over the past few year has made a real contribution in this connection.

Although slaughter stock in the Eastern Cape Region is mainly marketed straight from the veld, finishing in feeding pens [for weaner calves as well] is receiving more and more attention. This is the case particularly in the sour grassveld regions with a high rainfall where the production of feed can be practised successfully. In the sweetveld parts successful finishing in the veld is possible and rewarding.
A definite trend to market animals at a younger age is noticeable. The advantage of higher production of milk by breeding cows for the growth of the calf is clearly shown when dual purpose bulls are used on beef cows with a view to using the crossed heifers as breeding cows.

A handful of farmers who feed beef cattle on a large scale are found in the Highveld Region, but the intensive feeding and finishing of slaughter stock is not yet generally practiced.

The prejudice against oxen of the large milk and dual purpose breeds is not longer so strong and more and more of these types are found in feeding pens nowadays.

There is a noticeable improvement in the level of beef farming throughout the Transvaal Region. Better utilisation of the pasturage by means of correct pasturage management practices, better stock management practices, better stock management practices and the use of urea licks are becoming general. Oxen are marketed at an earlier age and there is less crossbreeding.

During 1971 the record number of 500 000 head of cattle and carcases was exported from South West Africa and slaughtered locally. This is an increase of about 21 per cent over the previous year.

A comprehensive and thoroughly organised new marketing scheme was successfully launched in South West Africa in 1971. For marketing in the controlled areas a quota for a period of 6 months is given to every meat producer in advance. This enables the producer to plan his farming properly, and also encourages marketing throughout the year which can, to a large extent, be achieved by correct veld management. But the biggest advantage of this scheme is that producers who exceed their carrying capacity are penalised, and that the scheme in this way effects soil and veld conservation.

**Beef cattle performance testing scheme**

The National Beef Cattle Performance and Progeny Testing Scheme is gaining more and more acceptance, and there are several breeders' societies that want to make performance testing compulsory for all their members. The total number of members participating in this scheme is at present 65,1, and 822 herds have been entered.
Plans have been drawn up for the erection of two new bull stables at Queenstown
and Vryburg and the transfer of control over the Omatjenne bull centre to the Animal
and Dairy Science Research Institute.

A total of 102,397 masses was measured, an increase of 18,284 over the previous
year. This increase can be ascribed to a good season and the increase in the
number of members.

The number of breeding cows subject to performance testing is about 100,000,
which represents five per cent of the total female beef cattle population – still a very
small part indeed.

The past year was characterised by good rain over most parts of the country so that
the weaning masses were considerably higher than in previous year. In several
cases weaning masses of 300 kg were achieved without any creep-feeding or
supplementation.

The fact that members must now have their own scales, expedites the
implementation and expansion of the scheme.

The Meat Board has allocated funds for the erection of testing facilities at Vryburg
and Queenstown, and consequently the growth tests of bulls in standardised
conditions [Phase C] will soon be considerably expanded.

A total of 2,242 bulls has already been tested under Phase C of the scheme. The
utilisation of the facilities was as follows over the past two years:

<table>
<thead>
<tr>
<th>Available place</th>
<th>1970</th>
<th>%</th>
<th>1971</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Irene</td>
<td>410</td>
<td>86</td>
<td>348</td>
<td>58</td>
</tr>
<tr>
<td>Queenstown</td>
<td>200</td>
<td>74</td>
<td>116</td>
<td>85</td>
</tr>
</tbody>
</table>

The poorer support at Queenstown can be ascribed to drought conditions.

During the past three years the following breeds have been very well represented at
these tests. [The total of bulls tested and their performance are summarised in the
following table]:

<table>
<thead>
<tr>
<th>Breed</th>
<th>Number</th>
<th>Final mass</th>
<th>A.D.I.</th>
<th>Range</th>
<th>A.D.A.</th>
<th>Feed consumption</th>
</tr>
</thead>
<tbody>
<tr>
<td>Afrikander</td>
<td>214</td>
<td>409</td>
<td>1,09</td>
<td>0,79 – 1,64</td>
<td>0,82</td>
<td>7,88</td>
</tr>
<tr>
<td>Brahman</td>
<td>155</td>
<td>491</td>
<td>1,29</td>
<td>0,87 – 1,80</td>
<td>1,00</td>
<td>7,49</td>
</tr>
<tr>
<td>Hereford</td>
<td>110</td>
<td>488</td>
<td>1,33</td>
<td>0,95 – 1,69</td>
<td>1,02</td>
<td>7,25</td>
</tr>
<tr>
<td>Pinzgauer</td>
<td>102</td>
<td>559</td>
<td>1,46</td>
<td>1,01 – 1,89</td>
<td>1,09</td>
<td>7,15</td>
</tr>
<tr>
<td>Simmenthaler</td>
<td>271</td>
<td>568</td>
<td>1,47</td>
<td>0,98 – 2,00</td>
<td>1,14</td>
<td>7,47</td>
</tr>
</tbody>
</table>

A.D.I. = Average daily increase
A.D.A = A.D.I. per age in days

The remaining beef breeds were represented to a lesser extent.

A characteristic of the results is the reasonably large variation in growth potential within each breed.

The growth testing of bulls on the farms of their owners [Phase D] has already reached the end of its first year. Each breeder is required to have a minimum of 15 bulls tested. The advantage of these tests is that the breeder himself must keep an eye on his bulls and can make up a ration from the available feed on his farm. The general trend is that a ration should contain 12 to 14 per cent of crude protein with about 50 per cent of roughage. The possibilities of this phase are very good.

Of the 268 bulls at the beginning, 240 completed these tests.

**Blood groups**

Blood groups tests and serum-typing were carried out on 1 322 head of cattle, and the following conclusions were arrived at:

*Paternity determinations* – 101 cases were received, 92 of which could be solved [91.1 per cent].

*Possible identical twins* – 15 pairs were tested, 3 of which were identical. Two sets of triplets were also tested during the year and they were not identical.

*Fertility* – 30 bull/heifer twins were tested to trace free-martinism as a result of blood mixing. In five cases there was no blood mixing and those heifers are thus potentially fertile. One set of triplets consisting of two bulls and one heifer were sent in and it was found that the heifer was sterile.

Altogether 136 bulls were tested for record purposes. They were mainly bulls whose semen is stored and A.I. bulls.

One case was received where the farmer was convinced that one of his calves was a cross between a cow and a wildebeest! By testing blood samples of the calf and its mother, it was found that the calf was not a cross.

The Department participated in the international comparison test in which reagents from various countries are compared. The results were satisfactory.

**Breeding**

The three most important production systems for farming with beef cattle under extensive conditions are the sale of weaner calves, the sale of store oxen at about 18 months and the marketing of slaughter oxen from the veld at about 3 ½ years and
older. At the Mara Research Institute the relative economic importance of the various production characteristics in these production systems was calculated.

Calving percentage is one of the most important factors of gross income in all three production systems. Pre-weaning growth also has great economic significance in the sale of weaner calves. The importance of pre-weaning growth or weaning mass decreases when the oxen are marketed at a later age. In the sale of store oxen are marketed at a large age. In the sale of store oxen and slaughter oxen from the veld post-weaning growth and calving percentage are the two most important factors of gross income.

In veld conditions at Mara it was found that weaner calves with a large body mass maintain their advantage in mass although they grow no faster aster weaning than weaner calves with a small body mass. For this reason a high weaning mass is important, even if oxen are only marketed at 4 ½ years.

At Mara and Messina there is, under veld conditions, little difference in the increase in mass between the different breeds and crosses that have already been compared. Characteristic of all the comparisons is that the breed or cross with the best weaning mass maintains that advantage. Apparently the feeding level on veld grazing is too low for oxen to be able to realise their inherent growth potential to the full.

It would appear that breeds and crosses with a good growth potential can gain at a rate of about ten per cent faster than the average on good veld grazing. On poorer veld grazing the differences are smaller. For greater increase in growth the solution lies rather in veld improvement than in the further genetic improvement of beef cattle.

The influence of the feeding level, age and breed on the appearance of oestrus and ovulation in dry beef cows was determined for Afrikander and Hereford cows and heifers with normal and submaintenance feeding rations over a period of three months.

Although the results indicate that oestrus is observed less regularly in the Afrikander [possibly as a result of the short duration of oestrus in this breed], it would appear that a low feeding level does not play a very important role in the breeding potential of the dry cow. Earlier research showed that abnormalities in ovulation may be an important cause of infertility in cows.

The connection between the growth rate and adrenal and thyroid activity of Afrikander and Simmenthaler bulls was investigated under performance test conditions. Blood from the bulls was analysed for cortisol and thyroxin and it is clear that the Afrikander had a lower thyroxin and a higher cortisol level than the Simmenthaler bulls. There was also a tendency for the growth rate of both breeds to show a positive connection with thyroxin and a negative connection with cortisol.

In a cross-breeding trial with Jersey cows the meat quality of cross-bred steers was compared with that of pure-bred Jersey steers. The meat of the cross-bred oxen
was evaluated by a trained panel of tasters and no statistical differences could be
determined for the various criteria, viz juiciness, tastiness, flavour and tenderness. Physical softness tests done with laboratory instruments confirmed the conclusions of the panel of tasters.

An obvious difference is that a statistically significant larger amount of fat was found in the muscles [graining] of the Hereford crosses [5,3 per cent] than in the muscles of the Simmenthaler [4,1 per cent], Brown Swiss [3,2 per cent] and Charolasis [2,5 per cent] crosses. These differences in the intramuscular fat of the four crosses was also confirmed by the total amount of fat found in the carcasses, viz 29,1 per cent, 24,2 per cent, 20,7 per cent and 21,0 per cent respectively. This very clearly illustrates the more effective production of red meat by the last three crosses than by Hereford crosses, especially in the light of the fact that the panel of tasters did not find the fatter meat more acceptable or more tender than the leaner meat of, for example, the Charolais crosses.

At Welgevallen young Simmenthaler x Afrikander cross oxen that had, after a year on a grain farm, been finished intensively in the feeding pen for sixty days, gave an average live mass of 457,2 kg with a carcass mass of 249 kg and were on the average graded Super.

At the Vaalharts Research Station it was found that the increased vigour of Brahman, Charolais, Hereford and Simmenthaler crosses in the veld as against pure Afrikanders at 30 months of age showed an average hybrid vigour effect of 20 per cent. The same tendency was found in the feeding pens where the animals had been fed for 118 days and slaughtered at 20 months.

The Charolais crosses show the highest average hybrid vigour in respect of growth in both production systems, but give by far the highest percentage of problem cases at birth because the calves are large and heavy. The Brahman crosses do particularly well in extensive conditions with excellent growth potential and carcass quality [based on grading].

Interesting results were also obtained at Vaalharts with the production of slaughter stock from the Jersey cow. The percentage of calving problems among Jerseys was lower than among Afrikander cows and very much better results with A.I. were obtained with Jersey cows in veld conditions than with Afrikander cows [15 per cent].

The post-weaning growth of Jersey crosses on veld was better than that of pure-Afrikanders. Even in the feeding pen Jersey crosses performed better than Afrikander crosses, but the Jersey crosses produce a carcase of poorer quality as a result of the poorer grading and higher percentage of fat around the intestines.

Pure Afrikanders and cross-bred Afrikanders were covered at two ages, viz at 20 months and 26 months [one year’s figures]. At the later age [26 months] no difference has to date been found between the various groups, but at 20 months a considerably improvement was found among the first crosses. Only 32 per cent of
the pure Afrikanders were found to be with calf as against the average of 78 per cent for the first crosses.
Feeding

The fattening of Simmenthaler steers at weaning age is producing excellent results. Steers finished on a high energy ration in feeding pens easily achieve the best grades at 11 ½ months. In 1971 twelve such steers were slaughtered after a feeding period of 4 ½ months. Ten of the twelve achieved Super grade, and an average profit above feeding costs of R34 per head of stock was realised.

Simmenthaler oxen taken to the feeding pens at 18 months achieved excellent grades after a feeding period of two months. Since the more intensive system results in less stock being carried on the veld, finishing of weaner calves deserves special attention.

Average daily gains of about 1 000 g were achieved with Friesland calves fed on a maize silage ration plus a protein supplementation for 200 days until the age of 13 months. Increases were slightly higher for bulls than for oxen, but the carcases conformation and fleshing of oxen and bulls were very satisfactory.

A study of the meat production capacity of eleven different breeds at the Omatjenne Research Station leads one to conclude that feeding and management are greater problem areas in the economic production of beef than breeding is.

The average calving percentage of these breeds was 79 per cent, while certain breeds maintained an average of 86 per cent over a period of 12 years. Rainfall, however, has a statistically significant influence on calving percentage, and calving percentage may vary from 56 per cent to 90 per cent, depending on the rainy season.

In the environment conditions of the cattle grazing regions of South West Africa economic production may be achieved with any of the following breeds: Simmenthaler, Hereford, Afrikander, Brown Swiss or Pinzgauer. The Santa Gertrudis also does very well in the Region.
One of the most important problems in beef farming in the Northern Transvaal Bushveld is to get the young heifer or ox to grow out after weaning so that it can reach the required body mass at an early stage in order to begin regular reproduction [in the case of the heifer] or be marketed as soon as possible without excessive feeding costs [in the case of the ox].

At the Mara Research Station these problems are being investigated with oxen of different breeds and crosses.

Results obtained over the past three years have shown that creep feeding that immediately precedes finishing has no advantage. There was very little difference in the required number of days in the feeding pen to reach the super grade, the total intake of feed and the final mass before slaughter between animals given creep feed beforehand and the control group.

Of all the different breed groups and cross groups the biggest difference in mass gain was observed in a comparison of the Hereford [with a daily increase of 0.99 kg] with the Afrikander [with an increase of 0.67 kg]. The variation within the breed groups or cross groups was very large.

The provision of a concentrate which provided about one half of the energy and protein requirements of weaner steers on dry winter grazing led to the body mass of the supplemented steers being up to 52 kg larger than that of the control animals at the end of the summer, one year after weaning.

Cross oxen, supplemented as well as control animals, showed the highest daily mass gain on veld grazing [0.36 kg and 0.24 kg respectively]. Among the control animals the Hereford and Simmenthaler showed the lowest gains [0.11 kg and 0.15 kg respectively], while among the supplemented animals the Afrikander grew the poorest [0.27 kg].

The results, collected over two year, therefore indicate that the provision of a concentrate to weaner steers on winter veld grazing cannot contribute profitably to an increased rate in the provision of high quality beef from the sweet bushveld regions of the country.

A herbage cutting trial to determine the production potential of different veld types has been initiated in Southern Natal.

The results of the first year indicate that different veld types vary mainly in the production of herbage bulk and to a lesser extent in the nutrient value of the herbage produced. Cutting at eight-week intervals produced the highest herbage yields. The expected daily gain of young grazing animals from such herbage varied between 0.47 kg and 0.65 kg for the different veld types, while the theoretical carrying capacity varied from 1.0 to 2.5 ha per large stock unit [500 kg].
The average area required per large stock unit for the different intervals of cutting are:

4 weeks interval – 2,1 ha; 6 weeks interval – 1,9 ha; and 8 weeks interval – 1,6 ha.

The limiting nutrient for young growing animals in summer veld appears to be crude protein, while at the fattening stage energy becomes a limiting factor.

Work with oesophagal fistulated cattle and sheep showed that sheep constantly selected a ration higher in crude protein than cattle. The crude protein content of summer veld was 5,68 per cent, that of the feed selected by cattle 7,06 per cent and that of the feed selected by sheep 8,35 per cent.

The ration selected on winter veld with a crude protein content of 2,00 per cent crude protein was 2,8 in the case of cattle and 4,9 per cent in the case of sheep. The ability of sheep to select crude protein to such an extent is one of the reasons why sheepfarming has been and still is one of the main farming enterprises in the highland sourveld.

**Management**

Some slight progress can be seen in the application of improved management practices.

At the Soutpan Experimental Cattle Farm Excellent results have been achieved since the change to the controlled, selective grazing system and the particular herd management practices that go with it. The calving percentages of cattle on this farm were on average only 56 per cent before the change, but have since risen to an average of 87 per cent. After the past covering season it was found that 90 per cent of the breeding herd had conceived – and this in very unfavourable conditions.

The weaning mass increased as dramatically – from 149 kg to 204 kg.

**DAIRYING**

**Production trends**

The number of cows and heifers over the age of two in the possession of Whites and the relation between beef and dairy cattle varied as follows during the past two decades:

<table>
<thead>
<tr>
<th>YEAR</th>
<th>BEEF CATTLE</th>
<th>% OF TOTAL</th>
<th>DAIRY CATTLE</th>
<th>% OF TOTAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>1949-1950</td>
<td>805 000</td>
<td>35,4</td>
<td>1 468 000</td>
<td>64,5</td>
</tr>
<tr>
<td>1961-1962</td>
<td>1 538 000</td>
<td>44,5</td>
<td>1 919 000</td>
<td>55,6</td>
</tr>
<tr>
<td>1970-1971</td>
<td>2 419 000</td>
<td>67,8</td>
<td>1 445 000</td>
<td>32,2</td>
</tr>
</tbody>
</table>
The proportion of dairy to beef cattle has reached a critical stage and milk shortages could follow unless further intensification is applied. That there has been greater efficiency in production and intensification during the period reviewed is clear from the fact that, although dairy cattle numbers have remained virtually constant since 1 949,50, fresh milk production has increased by 22 per cent, cheese milk production by 72 per cent and condensing milk production by 154 per cent, whereas beef production has risen by only 19 per cent during the same period.

The fact that milk production has improved by 961 litres per cow per year during the past two decades is an indication of favourable trends in the industry. The total production of milk is 1 459 000 000 litres a year at present. The number of suppliers of cream has dropped drastically from 53 825 to 45 215 over the past eight years.

Suppliers of cheese milk increased from 6 130 to 7 153 over the same period and condensing milk suppliers from 5 625 to 7 868. The number of fresh milk producers remained static at about 2 750.

The production of cheese milk and powdered milk is expected to increase still further. The fact that many cream producers are changing over to beef production, especially in low rainfall areas, is considered a favourable development.

Over the period 1950 to 1971 the per capita consumption of fresh milk dropped by 22 per cent and that of butter by 11 per cent, whereas cheese consumption increased by 25 per cent and the consumption of condensed and powdered milk by 89 per cent.

Problems and progress in connection with milk production

Breeding: The increasing use of A.I. and a well supported milk recording scheme make progeny testing for bulls on a large scale possible. The Friesland breed is continuing to gain ground as the chief dairy breed, largely because of its contribution to beef production, and Jerseys are making an increasing contribution to beef production through crossing.

Feeding: the generally low level of nutrition on which production is based, which is a direct result of the poor nutritional value of the natural pastures, remains the most striking problem of the industry. There has, however, been a considerable improvement in the average production per cow and the consumption of dairy rations has risen by 13 per cent over the past 10 years, in spite of the reduction in dairy cow numbers.

Management: the fact that in most cases dairy farming forms part of mixed farming systems means that the necessary supervision and management of the dairy enterprise is not always satisfactory. Relatively few dairy farmers keep abreast of new knowledge and developments and many are consequently unable to make their dairy enterprise a profitable undertaking.
Mechanisation in the dairy industry is increasing all the time and within a year the percentage of fresh milk farmers that use milking machines rose from 28 to 41. In all 38 per cent of fresh milk farmers already make use of milk tanks, and 7 per cent of all commercial producers use milk tanks for cooling.

**The Milk Recording Scheme**

The size of this scheme remained the same, although the efficiency of collaborating milk recorders increased.

This year 135 684 tests in respect of registered cows [butterfat and milk weights] and 271 894 tests in respect of grade cows were carried out; the corresponding figures for last year were 136 338 and 269 447. The number of herds served dropped slightly.

The average numbers of herds and cows tested per month are as follows:

<table>
<thead>
<tr>
<th>Friesland</th>
<th>Jersey</th>
<th>Other breeds</th>
<th>Total</th>
<th>Friesland</th>
<th>Jersey</th>
<th>Other breeds</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>448</td>
<td>291</td>
<td>154</td>
<td>893</td>
<td>20 327</td>
<td>9 155</td>
<td>4 482</td>
<td>33 964</td>
</tr>
</tbody>
</table>
The monthly average represent about 45 000 cows a year undergoing testing.

The emphasis was placed on control and the testing of new techniques to overcome problems in the present system.

**Pilot scheme in connection with sampling by owners**

This project is progressing satisfactorily. Results indicate that problems such as staff shortages, financial pressure, accuracy and speed could be eliminated if the present scheme were modified to allow the owner to collect the milk samples for each month and dispatch them to a central laboratory.

A total of 41 918 samples was sent to the central laboratory at Glen; 40 321 could be tested, 161 sample bottles were broken in transit and 287 samples were curdled and could not be tested.

On 100 different occasions 5 021 samples were collected for checks and the results were found to differ very little from the results of tests at the central laboratory.

On the average 37 herds took part in this investigation.

It took an average of eleven days from the time the owner took the sample to the time he received his processed data, whereas it takes about three months under the present scheme.

In the Western Cape the scheme was so successful that the amalgamated Transvaal and Boland A.I. Co-operatives are going to apply it on an extensive scale in order to carry out breeding tests on nominated young bulls.

**Developments**

During the year review the Transvaal A.I. Co-operative started its own milk recording round, which will work under the same supervision and control as the milk recording co-operatives. The round consists of 12 herds from which 1 080 cows have already been entered for official milk recording.

These cows are all inseminated with prescribed semen from specially selected bulls in order to analyse the breeding value of the bulls.

During the year under review the Natal Milk Recording Co-operative amalgamated with the Natal A.I. Co-operative, which is progressing very well.

A.I. services expanded during the past year, particularly in herds used for milk recording, so that at present there are 273 herds with a potential of 27 300 cows which this breeding method is used.
Processing milk records

Milk records had been far behind as a result of the change-over to the computer, but were virtually brought up to date during the year under review. In addition to about 45 000 records normally dealt with in the course of a year, an additional 121 128 completed records were dispatched to collaborating farmers.

A summary of the records of registered cows tested during the past two years follows:

<table>
<thead>
<tr>
<th></th>
<th>1969/70</th>
<th>1970/71</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total number of records dispatched to farmers</td>
<td>15 735</td>
<td>16 069</td>
</tr>
<tr>
<td>Short lactations [unusual reasons]</td>
<td>11.4%</td>
<td>19.3%</td>
</tr>
<tr>
<td>Lactations on which averages were based</td>
<td>13 946</td>
<td>12 991</td>
</tr>
<tr>
<td>Average milk production per cow [kg]</td>
<td>3 792</td>
<td>3 732</td>
</tr>
<tr>
<td>Butterfat percentage</td>
<td>4.14%</td>
<td>4.18%</td>
</tr>
<tr>
<td>Fat-corrected milk per cow [kg]</td>
<td>3 872</td>
<td>3 833</td>
</tr>
<tr>
<td>Short lactations [usual reasons]</td>
<td>12.3%</td>
<td>13.3</td>
</tr>
</tbody>
</table>

Milk

The efficiency of the infra-red pasteurisation of milk – The efficiency of the infra-red pasteurisation of milk was compared with that of the conventional, steam-heated plate pasteuriser, using total counts, coli count, methylene blue reduction time after 18 hours incubation at 18° and residual phosphatase as criteria.

No significant differences were found between the efficiency of the two types of pasteurisers and their effect on flavour and creamline were found to be similar. It was concluded that the infra-red type of pasteuriser could be accepted by local health authorities, provided that certain modifications are made to the safety devices to ensure that no unpasteurised milk leaves the plant.

This type of pasteuriser can fill a definite need in small dairies in South Africa as it is compact, easily installed and operated and does not require costly steam and refrigeration installations.

Nitrate reduction time for estimating the bacterial content of milk – The purpose of this study was to investigate the role which the coliforms, psychrotrophs and thermodurics play in the reduction of nitrate and whether this criterion can be recommended as an index of the hygienic quality of milk.

On the average the reduction time was shorter for refrigerated milk than for can-collected milk with a given count. When the reduction time was determined after pre-incubation the relative importance of the initial number of coliforms increased while that of the psychrotrophs decreased and the thermodurics became relatively insignificant.
Sampling of milk for butterfat determination – The possibility of replacing the present butterfat sampling and testing method [sampling daily and tested as 10-day composites by the Gerber method] by another method was investigated.

Under certain conditions and when the samples were properly taken, preserved and handled, it may well be possible to test 15-day composites and to keep the samples for another week for a check test by an inspector.

Quality of industrial milk – A survey conducted at a large cheese factory during February and March proved that a methylene blue reduction time of 90 minutes will be an indication of acceptable quality in industrial milk. The results have shown that 70 percent of the samples had reduction times of 90 minutes or less which means more than 13 million bacteria per ml.

Keeping quality of fruit-milk drinks – The keeping quality of milk which was flavoured by the addition of different fruit juices and stabilised to prevent coagulation was determined and found similar to that of pasteurised milk [2-3 days at 15°C].

Cheese

Cheese starter programme – The local cheese industry still has to import its commercial starter cultures. It is, therefore, intended that the Institute should constitute and produce cheese starters.

The selection of specific cultures will have to be accompanied by a thorough study of their taxonomic and physiological properties in order to constitute the most suitable culture. A number of projects is involved.

Certain commercial cheese starters were thoroughly examined to learn more about their properties, composition and activity.

Isolations and identifications from 13 commercial starters were carried out. Almost 400 isolates were made and it was found that the greatest percentage of these are Streptococcus cremoris and S. diacetilactis.

It was also established that there is little difference in activity between the starters grown 25°C and those grown at 22°C. The total count does, however, tend to be slightly higher at 25°C.

Methylene blue activity tests were carried out on certain isolates from the starters examined. It was found that the repeated transfer of these isolates to milk did not increase the activity of all the isolates. In certain cases the activity even dropped.

Composition of cheese starters for the preparation of South Africa Gouda cheese – Six cheese starters were constituted by choosing certain isolates from the groups on which he methylene tests were carried out. It was established by means of acid
titrations that the activity of these starters remained virtually constant. They are used to manufacture Gouda cheese. Excellent results were achieved with one of these starter cultures, and a second also gave good results. Certain isolates from the starters investigated were also chosen for use as single-strain cultures in the manufacture of Gouda cheese.

*Rind defects in Gouda cheese* – Difficulties with cracks in the rinds of Gouda cheese are often experienced and it was found that pieces of curd joined to make a cheese very often resulted in cracks at the joints if the curd had cooled down before joining. It is now recommended that curd blocks be cut as accurately as possible to minimise the number of joined-curd cheeses and that incorrect sized pieces of curd should not be allowed to accumulate until the end of the mould filling operation.

*Shrinkage, appearance and wax adhesion of Gouda cheese* – the appearance of Gouda cheese on the South African market often leaves much to be desired. In a study it was found that two applications of polyvinylacetate at three and eleven days after brining, followed by waxing at 14 days, gave the most acceptable results as far as appearance and wax adhesion was concerned. This treatment, however, resulted in an increase of 1,5 per cent in shrinkage when compared with standard treatments, but made it possible to cure at higher relative humidities without serious mould problems.

If, therefore, it is possible to increase the relative humidity to approximately 10 per cent the increased shrinkage could be eliminated and satisfactory appearance be obtained at no extra costs.

The pH of the brine had no significant influence on appearance, shrinkage or wax adhesion over the range tested.

*Flavour development in cheese made from skim milk and vegetable fat* – Cheese making experiments were carried out, using milk in which the butterfat had been replaced by a vegetable fat. The results proved that it was possible to make cheese with a satisfactory quality from skim milk and vegetable fat. This cheese did not, however, develop a typical cheese flavour. When the butterfat was only partly replaced the intensity of the cheese flavour increased and when vegetable fat containing short-chain fatty acids [coconut oil] was added to this milk, a pronounced flavour developed, resembling goat’s milk cheese.

The results suggest that most of the substances responsible for the cheese flavour are formed during the ripening process from triglycerides containing short-chain fatty acids.

*A study of the microflora of South African Gouda cheese up to selling age* – The composition, development and effect of the microflora in Gouda cheese, and the possible relationship between these bacteria and ripening and certain defects were investigated. Microbiological, chemical and organoleptic investigations of 26 cheese samples from 20 cheese factories were carried out when the cheeses were one, four, six and eight weeks old.
In view of the conditions under which Gouda cheese is produced, and the quality of milk received, the microbiological and organoleptic findings indicate fairly acceptable quality. There is room for improvement, however, chiefly with regard to the coagulase-positive *Staphylococci*, although in most cases numbers were below the acceptable count of 500,000 per gramme.

Recommendations based on this study can be made to factories. The study also revealed defects that justify further research on specific subjects.

*The salting of Gouda cheese in brines* – A number of experiments was done on the acidification of brine. It was found that a high degree of acidity [pH = 5.0] caused slightly greater loss of weight. However, the effect of osmotic pressure, particularly in old brines, should also be taken into account here. Acidified brine ensures that rind formation will be good and the bacterial content will be kept low. Brine with a pH of 4.9 to 5.0 is recommended for factories.

**Butter**

*Investigation of oxidative taste development in butter* – The development of fat defects in butter is ascribed to the oxidation of the unsaturated fatty acids and the consequent formation of carbonyl compounds, some of which lead to the typical oxidation defects in butter. Testing to determine the deterioration of butter at an early stage was carried out and the test butter was compared with butter kept at normal storage temperatures.

The findings show that the acid value together with the carbonyl value will give a good indication of the degree of oxidation and the oxidation capacity of butterfat.

*Judging the quality of butter by means of bacteriological analysis* – Four bacteriological count procedures were subjected to evaluation during this study. With regard to prediction of the keeping quality of the butter four different tests were decided upon.

The moisture distribution in the butter was well correlated with the growth of the bacterial groups in salt content expressed as percentage of the moisture content, had a significant effect in suppressing the growth of bacteria in the butter. The salt-in-serum content also had a significant effect on grading after 5 months at 10°C. According to this a higher salt content gives a better grading figure after 5 months than butter with a lower salt content.

*Objective quality judging and the determination of the keeping quality of butter* – Samples were collected periodically from five creameries and stored at 20°C [for the rapid keeping quality test] and at 10°C [ordinary commercial storage temperature]. The samples were analysed at regular intervals for a period of six months for moisture distribution, moisture content, salt content, pH, total saturated and unsaturated carbonyls, peroxide value, acid value, contaminating organisms, lypoletic and proteolytic bacteria, yeasts and moulds.
The separate and collective contributions of these quality characteristics to decline in quality could be determined by carrying out analysis directly after churning and after one week storage at 20°C. It was clear that these quality characteristics each made a greater or lesser contribution to the decline in quality during storage.

These characteristics are responsible for 55 per cent of the total decline in quality, but 45 per cent must be ascribed to subjective or organoleptic criteria. In the case of the keeping quality the figures were 64 and 36 per cent respectively.

**By-products and other dairy products**

*The ultra-filtration and inverse osmosis programme* – the concentration of the solids in milk and milk products, and the separation of certain milk constituents by means of inverse osmosis and/or ultra-filtration, are new developments in the dairy industry. Their advantage is that heat treatment and separation by chemical means are eliminated, and this ensures that no changes in the milk constituents take place. These processes may also have economic advantages.

The first stage of this programme at the Animal and Dairy Science Research Institute includes studies on various techniques, including the following:

*The concentration and fractionating of milk constituents* – It was found possible to concentrate skim milk to a solids content of up to 40 per cent. It was found that the milk had to be pumped evenly through the apparatus. A piston pump is not suitable, because it damage the membranes. The use of proteolytic enzymes was not very successful, but is undergoing further investigation.

The loss of good nutrients in whey is considerable, but it was found that it was possible to concentrate whey to a solids content of over 15 per cent, two thirds of which is lactose.

*The application of the concentrate [retentate] from skim milk* – The production of both cheese and a spreadable product that keeps for at least 14 days was undertaken. With its low fat content the product obtained palatable and may be used in many dishes.

**The quality improvement service**

A quality improvement service for butter was started with the object of ensuring greater uniformity in quality.

During previous investigation, and after a testing period of six months at five different creameries, it was found that quality may be divided into three classes in which each property carries a certain weight [multiplication factor] that corresponds to its particular contribution to quality.
In the performance of this service, 271 samples of choice butter from 20 creameries were examined. The results indicate that the control of moisture distribution, percentage moisture, pH and salt has already improved considerably. The poor carbonyl and acid values found indicate that oxidation of the butterfat still occurs. Most butter had a high count of contaminating organisms and creameries with wooden churns again had high yeast and mould counts.

Under the present grading system, 81 per cent of the butter is classified as choice grade, but under this system of objective quality judgement only 40 per cent would comply with the requirements for choice grade. As far as keeping quality goes, only 20 per cent of the butter would still be graded as choice after a storage period of five months at 10°C. These results show that there is a great deal of room for improvement.

**Extension and training**

Officers from the dairy section of the Animal and Dairy Science Research Institute gave extension in various areas and served on committees to advise persons in the dairy industry. The following are some of the chief services performed in this connection:

The section concerned with dairy product improvement services followed up butter analyses in order to improve the quality of butter. Moisture distribution and pH, the two factors that have a great effect on keeping quality, are at present carefully controlled by several factories.

Assistance was given to various factories where cheese starter problems had been encountered. At one factory the problem of coagulation of sweet, skimmed condensed milk was investigated and recommendations aimed at preventing this problem are now being implemented.

Dairy scientists from the Animal and Dairy Science Research Institute are involved in all the chief agricultural shows where dairy products are judged.

Officers assist in designing factories and in erecting apparatus and make general recommendations on the purchasing of apparatus and factory equipment.

The extension section of the Institute is continuing to give advice, demonstrations and instruction on chemical and bacteriological analyses; these analyses are also undertaken for factories and producers.

Five different courses – on dairying, cream testing, cream grading, milk tests and making of Gouda cheese – were offered by the dairy section at Glen and attended by a large number of students.
Feeding

Rearing Friesland heifers at various nutritional levels – In the second phase of the feeding trial at Elsenburg the growth and fertility of heifers fed on silage and a limited quantity of concentrates [without grazing], are being compared with those of a group of heifers that had free access to a mixture consisting of lucerne hay and oat hay plus a mineral protein lick in a kraal system [without grazing]. The heifers grew better on hay plus the lick and so far they have reached the covering mass 37 days earlier on the average and calved 47 days earlier than the other group.

After the first calving the heifers in the hay-plus-lick group were 38 kg heavier on the average than the other heifers and their average mass was only 7 kg less than that of the heifers fed at a high level, which included a high percentage of concentrates, during a previous stage of the project.

Rearing calves on skim milk plus skim milk balancer – In a trial at Elsenburg in which two levels of skim milk, viz 7 per cent of body mass a day up to a maximum of 9 litres a day, and two methods of feeding, viz, artificial teat feeding and bucket feeding, are being compared, no significant differences in growth increases in Friesland calves were found.

The results show that under these conditions there are no advantages in giving calves milk by means of an artificial teat instead of in a bucket and that the lower level of skim milk provides enough protein to supplement the protein in the low-protein mash used.

Since the calves are weaned from whole milk at the early age of four weeks and the mash is relatively cheap because of its low protein content, this system of rearing can mean a great saving in costs.

Jersey calves, unlike Friesland calves, did better on the higher level of skim milk than on the low level.

Vitamin A and B carotene status of herd replacement heifers at Elsenburg – Since there has been some concern about the supply of vitamin A to dairy cattle in the Winter Rainfall Region and the use of silage in intensive feeding kraal systems has come under suspicion, a survey on the blood vitamin A and blood carotene status of two groups of heifers was carried out at Elsenburg: one group is reared exclusively on silage plus limited amounts of concentrates [without grazing] and the other on a hay mixture plus lick [without grazing].

In both groups of heifers the average blood vitamin A and blood carotene values over a period of six months were satisfactory. The silage does in fact provide more carotene than the hay mixture half of which consisted of lucerne hay and the other half of oat hay.
In the same trials it became clear that calves that were growing rapidly and were weaned at four weeks and then reared on calf starter mash containing 10 per cent of lucerne meal did have a significantly higher vitamin A status and grew better than similar calves reared on the same starter mash, with 10 per cent of oat hay meal instead of lucerne meal.

**Complete diets for dairy cows** – There has been increasing interest in the use of complete diets, which may be mixed by feed firms and delivered in bulk and may serve as the only ration for cows kept on small properties in kraal systems.

At Welgevallen in the Winter Rainfall Region trials were carried out in which a conventional ration consisting of hay, silage and concentrates fed according to production was compared with two unconventional rations fed *ad lib*. In one ration the hay and concentrates were pre-mixed in the ratio of 10:70 and in the other case the cows had free access to ground hay and concentrates in separate feeding troughs.

There were no significant differences in milk production between the first two groups of cows, but the third group, i.e. the one fed the “free choice” ration, which took in more feed, produced 10 per cent more milk. No significant differences in protein and butterfat production could be established. As far as the efficiency of energy conversion goes, the group of cows kept on the conventional ration did best.

The use of complete diets is probably a more expensive feeding system, except where labour is very dear or where the management and handling of exceptionally large herds milked in walk-through milking parlours make it profitable.

Research in the Eastern Cape on the development of complete silage rations for dairy cows showed that a 40:60 concentrate: silage mash [on the dry basis] gave better results than the 50:50 or 30:70 mashes. Trials where *Eragrostis curvula* was used in complete diets for dairy cows showed that there are major drawbacks. Homogeneous concentrate-roughage mashes are not available and animals are still inclined to eat selectively. In addition, finely ground *Eragrostis curvula* irritates the mucous membranes and the feed intake tends to be below normal.

During the winter of 1971 a grazing trial was conducted at Cedara to establish the grazing and economic value of rye-grass as a winter feed:

**Treatment 1:** Cows received silage and hay and concentrates at the rate of 0,4 kg per litre of milk produced in excess of 6,7 litres.

**Treatment 2:** Cows received rye-grass grazing for 5 hours per day and hay. Concentrates were fed at a rate of 0,4 kg per litre of milk produced in excess of 11,2 litres.

**Treatment 3:** As for treatment 2, but concentrates were fed at 0,4 kg per litre of milk produced in excess of 6,7 litres.
The trial showed that there was no difference in milk production between the groups grazing rye-grass. The extra concentrate fed to the cows in treatment 3 was, in fact, wasted.

The results showed that both rye-grass groups were economically superior to the silage/hay group and that a considerable saving in cost could be made by judicious feeding of the concentrate.

There was no significant change in live mass of the cows during the trial, nor was there any significant change in milk quality as far as solids-not-fat and butterfat percentage are concerned.

From the milk production obtained and the intake figures, the actual feed value of the rye-grass was calculated at:

Total digestible nutrients 66.4 per cent and 15.8 per cent digestible crude protein.

One of the most prolific summer growing pastures in the Natal midlands is kikuyu *Pennisetum clandestinum*. This grass is used fairly extensively. However, milk production from kikuyu very seldom measures up to its potential as determined by chemical analysis. A grazing trial was, therefore, designed in order to determine more specifically the nature of the problem.

The trial consisted of three groups of cattle with 10 cows in each group.

Treatment for group 1 – Kikuyu grazing supplemented with a 13 per cent crude protein ration.

Treatment for group 2 – Kikuyu grazing supplemented with maize meal.

Treatment for group 3 – Kikuyu grazing supplemented with a 13 per cent crude protein ration and also *Eragrostis curvula* hay fed *ad lib*.

Any advantage of feeding extra energy should be shown up in improved milk production in group 2, whereas any advantage from increasing the available dry matter should be shown up in milk production for group 3.

The preliminary results of this trial revealed that certain trends were fairly clear:

- There was no advantage in feeding a more expensive protein concentrate ration. Milk production from maize meal alone was at the same level, showing that only total digestible nutrients needed supplementation.

- There was no advantage in feeding hay in the early part of the season. But an increase in level of production became evident in cows receiving hay from February on.
Dry matter intake appeared to be adequate, being about 3 per cent of the live mass of the cows.

At the Uitkomst Research Station in South West Africa the project aimed at establishing whether milk production on a more intensive scale would be profitable was continued. The latest results again show that the Frieslands in the group fed at the high level produced more than the Brown Swiss cows. However, in the group where the feeding level was low the opposite results were obtained, which is an indication of the better adaptability of the Brown Swiss.

**SHEEP AND WOOL**

**Production trends**

The low wool prices and the Stock Reduction Scheme were responsible for a great change in the Merino sheep industry in the Karoo Region. Besides achieving its primary aim, namely veld improvement, the Scheme is also bringing about an improvement in the quality of Merino flocks. The sheep that have been retained, are subjected to strict selection for high production, good quality wool and also reproduction.

The good grazing conditions since the second half of the year under review, together with smaller numbers of stock [but of better quality], must inevitably lead to higher production per unit of small stock. The lambing percentage also rose appreciably.

In view of the market rise in meat prices and low wool prices a fairly general change-over to mutton-wool sheep was inevitable. Culled Merino ewes which were previously sold as slaughter animals are now used on a large scale for the production of slaughter lambs.

The average prices for wool towards the end of the season were 62,5 per cent higher than the opening prices. The increase in the average price compared with the previous season now stands at 18,5 per cent. This large-scale improvement has given farmers a new confidence in their product and a general spirit of optimum previals.

The good rains of the season, the rising wool prices and the high prices for mutton brought about a definite revival of the sheep industry in the Eastern Cape. As a result of a sharp swing to breeding on a larger scale the composition of flocks is rapidly changing and ewes are replacing wethers on a large scale. More and more slaughter animals are finished in sophisticated systems and at an earlier stage.

Sheep numbers in the Free State Region declined considerably, and on some farms the Stock Reduction Scheme has led to sheep farming being stopped altogether. But the decline in sheep numbers resulted in an improvement in the quality of the remaining sheep. Furthermore, ewe farming is on the increase at the expense of wether farming.
The result of stricter selection and better grazing conditions is that a higher income is obtained per sheep unit.

A market intensification of the sheep industry is taking place in the Transvaal Region. Farmers are dispensing with specific lambing and breeding seasons, and efforts are being made to obtain as many lambs per year as possible. But injudicious veld management practices are slowing down this trend.

The year under review will be known as a period of unprecedented prosperity in the Karakul industry. For the first time in history average pelt prices rose to more than R10 a pelt. The highest average price was R10,64 per pelt.

There is an ever increasing interest in breeding for coloured Karakul pelts, so that at present the demand for white and brown Karakul rams cannot be met.

The total production figure for 1971/72 is put at 5 647 734 pelts which realised R50 263 832.

During the 1971 calendar year, the Republic's contribution amounted to R36,3 per cent of the total SWAKARA production. This indicates that while the production in South West Africa remained more or less constant the Republic was to a large extent responsible for the 4,6 per cent increase from 1970 to 1971.

In the western parts of the Free State Region, great interest developed in Karakul sheep because of the high prices obtained for Karakul pelts. As a result of this, and the implementation of the Stock Reduction Scheme, there was a considerable decline in the numbers of Dorper and Dorper-type sheep kept for meat production.

**Mutton-sheep performance and progeny testing scheme**

37 Farmers are now participating in this scheme which continues to make fairly steady progress. During the year under review, data has been received chiefly from Dorper but also from Dormer, South African Mutton Merino and Dohne Merino breeders. The data of 4 377 lambs has been processed.

Officers working on the scheme assisted in the selection of 25 597 sheep during 1971-72 compared with 15 564 in the previous year.

**Performance testing of woolled sheep**

In developing performance tests for woolled sheep, the Animal and Dairy Science Research Institute encountered many problems in the first few years. These difficulties were solved in due course so that performance testing of woolled sheep is now firmly established. Approximately 12 000 wool samples are now analysed annually, but indications are that a much larger number of samples will be analysed in the future.
Performance measurement of the characteristics of a woolled sheep is a fairly new practice in wool farming. In view of the great stress formerly laid on the subjective evaluation of wool characteristics, especially in training farmers in sheep and wool science, it is understandable that wool farmers and officers will not immediately appreciate the value of objective measurement.

The imparting of knowledge about performance testing of woolled sheep, based on performance measurements, and about the advantages of these tests, is an important function of the South African Fleece Testing Centre. A great deal of research had shown that this knowledge can only be imparted to farmers effectively through the type of lectures and demonstrations offered in day and week courses. The method of presentation has also gradually been refined, particularly by means of audio-visual aids.

A number of breeders have already joined the Performance Testing Scheme for woolled sheep. Meetings of these breeders in the form of symposiums are also planned to enable them to exchange ideas, and in this way to increase the effectiveness of performance testing.

**Other steps to promote wool production**

To ensure the production of good quality wool, research in the Karoo Region has concentrated on factors which have a detrimental effect on quality and on means to eliminate these factors. It has been established *inter alia* that excessive weathering may cause a 30 per cent loss in wool fibre length.

A comparison of wools grown during different seasons showed market differences in the degree of weathering. The effect of the seasons on the degree of weathering, especially deeper damage, may be mitigated to a large extent by ensuring that sheep are not covered with long wool during the hot summer months.

The South African Wool Board’s Field Services, which have been taken over by the Department, are being continued unchanged. During the year under review all applications for wool schools and other services were dealt with.

Research in the Eastern Cape Region in respect of the influence of feeding deficiencies on wool fibres during the year clearly indicates that a medium to overstrong wool is developed from October to February. The fibre thickness also declines much more sharply in autumn than in winter. This extreme fluctuation in fibre thickness is detrimental to wool quality.

The long-term selection trials on sheep at the Grootfontein Agricultural College, the Carnarvon Experimental Farm and in the Tarka Soil Conservation Area are progressing satisfactorily. With the development of a new white-woolled mutton breed for extensive farming areas the last part of the basic crossing programme was completed during the year under review. Attention will be given in the future to selection for growth and reproductiveness within and among the groups to be crossed.
The influence of raised temperatures on the genital organs of rams – High temperatures have an effect on the male reproductive system. Karakul rams were subjected to high environmental temperatures before, during and after puberty to establish to what degree these temperatures would affect the reproductive system. Preliminary results have shown that environmental temperatures as high 43°C for about 6 hours per day have no significant effect on puberty and production of semen in sheep.

The induction of parturition in the Karakul ewe – To follow up previous findings with flumethazone the experiment was repeated with dexamethazone. Results show that the latter was not as effective for the above-mentioned purpose as flumethazone. Various hormone determinations were done on samples which were collected during this experiment.
Lactation-anoestrus in the ewe – An experiment was carried out with twenty South African Mutton Merino ewes [breeding season begins in October/November] and twenty crossbred Mutton Merino X Border Leicester ewes [breeding season begins in February]. The ewes lambed during the second half of October.

The conclusion arrived at was that if ewes received adequate feeding and suckling was limited to a maximum of three months, lactation-anoestrus was of no practical importance. The influence of the lambing season in relation to the breeding season is probably of much more importance. As regards the breeding of Karakul sheep in the Free State Region, breeders now chiefly concentrate on the sought-after pelts of the SWAKARA shallow curl type. According to auction sales reports of 1971, about 65 per cent of the total number of pels marketed were of this type.

There is a growing realisation of the importance of colour variation in the Karakul industry. The lead has been taken at the Kalahari and Gellap'Ost Research Stations with regard to the breeding of white and grey sheep. It is clearly very important at this stage to maintain improvement in the pipe curl types. With this object in view, the small number of pipe curl types at the research stations will shortly be brought together at Neudam.

Efforts are still being made to raise the production rate and fertility of the Karakul sheep. Hormone swabs in ewes. The results of different projects are now beginning to throw light on problems that existed in the past, such as the duration of the swabbing periods, the dose of PMS [pregnant-mare serum] which would produce mainly twins in the period of PMS administration.

It is evident, up to now that the use of PMS within the breeding season produces better results with smaller doses which are applied two days before the withdrawal of the swabs. The longer swabbing period [15 days] did not only improve the conception, but also resulted in a higher total lambing percentage.
The long-term results of hormone treatment indicate that swabs plus PMS out of breeding seasons followed by normal mating without treatment in the breeding seasons, should produce better results than two hormone treatments a year. The primary phase of a project where the effect of weaning age [coupled with creep feeding] was investigated, indicated that the weaning age in itself had no significant effect on the growth and puberty of autumn-born lambs. The autumn-born lambs were inclined to reach puberty only during the following breeding season [10 –12 months of age]. The ewes from the different groups showed no difference in conception when subsequently mated.

The first positive results with an earlier dual mating season with flushing led to a total lambing percentage of 181 per cent as against 163 per cent from the uninterrupted mating group.

Feeding

The Animal and Dairy Science Research Institute has carried out the first stage of a project to determine the reasons for differences in production efficiency between animals. This study was carried out with sheep.

It appears that the differences in the body composition and feed intake of animals are largely responsible for the difference in production efficiency. A third factor is the genetic capacity of an animal to use nutrients for specific useful functions of production. This genetic capacity differs considerably in different types and offers
great possibilities for selection. Knowledge of this factor is of great value in establishing more effective standards in selection programmes. It has also been

Established that the tolerance of certain indigenous types of stock for unfavourable feeding conditions is closely connected with a high percentage of fat in body mass increase. This hardiness does not go with a high production capacity under favourable conditions.

The Department's first open track, gas exchange apparatus is rapidly nearing completion. It will then be possible for the first time in South Africa to determine the net energy value of feed for sheep, goats, calves and pigs without having to slaughter the animals. The large variety of ruminants in South Africa [various indigenous stock types as well as a great number of wild species] makes it possible for researchers in South Africa to make a unique contribution to the world's store of knowledge regarding the differences between ruminants in production capacity and efficiency. With this object in view animals such as the indigenous fat-tailed sheep and blesbuck are used to advantage in the research programme of the Animal and Dairy Science Research Institute, to test the efficiency of fodder consumption in farm animals.

An experiment is now being carried out to find practical methods to make the potential energy of frostbitten grass available for animal nutrition. It is already possible, in the laboratory, to surmount the suppressive effect of the lignification process on the nutritive value of grass. An attempt is now being made to find practical ways of converting the tremendous quantities of dry grass, burnt as useless every year into useful animal product.

Results of experiments with large numbers of sheep indicate that the use of radioactive tritium holds out great possibilities for ascertaining the body composition of the living animal. This is a very simple technique and can be applied rapidly and at a low cost.

The evaluation of the change in the body composition of animals in various experiments is a reliable criterion in nutrition study.

In the Karoo Region seasonal and protracted droughts present the greatest problem as regards feeding. For this reason feeding research is mainly focussed on drought feeding.

The information obtained from this research has given satisfactory results when applied in practice. For instance, it was found that the protein content of natural grazing in most of this Region during a seasonal drought is not the limiting factor in the case of dry sheep, and that energy and phosphate supplementation can accelerate the increase in body mass.

The problems engendered by droughts can, to a large extent, be alleviated or solved by the utilisation of drought-resisting crops, the supplementary feeding of suitable rations and the fattening of old surplus sheep.
A survey showed that about half the sheep farmers in the Natal Region did not mate their young Merino ewes until the four-tooth stage or later. Investigation at the Kokstad Research Station showed that a large percentage of the ewe flock did not reach the required mating mass at 18 months of age owing to the poor growth of autumn-born Merino lambs during their first summer on the veld.

In a preliminary trial seven of the fourteen lambs reached a mating mass of 36 kg at 18 months of age. Ninety-five per cent of this mass was gained on grown feeds and only 5 per cent off the veld.

Experiments were initiated to try to boost the growth of these weaned lambs on the summer veld. Molasses supplementation gave an increased final mass at the end of the grazing season 1.6 kg better than the veld control group, a protein supplement yielded 1.9 kg and a protein ad mealiemeal supplement yielded 5.4 kg better than the veld control. Similar ewes on an irrigated pasture produced a mass gain 11.1 kg better than the veld control group, illustrating the potential of Merino lambs to grow when given the right conditions.

Oesophageally fistulated sheep were used at the Kokstad Research Station to sample summer veld. The crude protein of veld samples taken from the fistulated lambs averaged about 8 per cent over the grazing season while grid samples of the veld averaged 5.5 per cent crude protein. These fistulated lambs kept on veld over the winter yielded samples giving crude protein percentages of 6.5 per cent in May to 5 per cent crude protein in early August.

During the same period the grid veld samples yielded 3.4 per cent crude protein in May down to 2.5 per cent crude protein in early August. This illustrates the ability of lambs to select for crude protein, but at the expense of body mass which dropped from 36 kg in May to 27 kg in early August.

Research on the intensification of sheepfarming still enjoys high priority in the Department of Sheep and Wool Technology at the University of Pretoria. A great deal of attention is given to increasing reproductive efficiency and the concomitant problems. The first stage of the investigation into the handrearing of lambs has been carried out successfully. It was evident from this that lambs which grew up on milk substitutes thrived just as well as those which were suckled.

The economics of this practice are being investigated in a project in an attempt to cut down expenses so that it will be more acceptable to the farmer.

In the Free State Region the hybrid sorghum Trudan II offered outstanding grazing for sheep during the past summer. Pasture which was utilised for the first time in the 45 cm stage and the regrowth of which was repeatedly cropped supplied more than
7 000 days of sheep-grazing on green fodder without a single case of prussic acid poisoning occurring.

The same sorghum yielded very good results when it was grazed for the first time in the soft doughy kernel stage. The sheep made good use of the pasture but a considerable quantity of residue in the form of hard stalks remained behind. Nevertheless, the regrowth of this pasture was good.

The influence on wool growth of urea, fishmeal and methionin as supplements to a low protein ration was investigation in the Winter Rainfall Region. In comparison with urea, methionin and fishmeal pushed up wool production by 11 and 30 per cent respectively. The highest wool production, however, was obtained with the supplementation of both methionin and fishmeal.

The influence of formaldehyde treatment, dry heat and steam heat on the digestibility of six different protein sources was also investigated. It was noted that there was a diminution in the rumen digestibility of all the sources of protein which was in direct relation to the amount of proteinbound formaldehyde. Both the heat treatments also resulted in a significant reduction in the rumen digestibility. It was noted that there was considerable variation in protein sources as regards the degree of the reduction in rumen digestibility.

All these treatments also has a suppressive effect on the hydrolysis of proteins in pepsin. This affect was minimal in the case of steam-heat treated lupin seed and maximal in that of formaldehyde-treated fishmeal.

This research was followed up with a study of the utilisation of formaldehyde- and heat-treated protein sources in terms of tissue and wool growth. The results show that there is an important interaction between the energy level, the protein source and the method of treatment.

Lupin seed-meal and fishmeal were compared with each other as protein sources in the rations of lactating ewes. Over a lactation period of 13 weeks it was found that ewes on lupin seed rations yielded 18 per cent more milk than those on fishmeal rations. The total production of butterfat however was 4,6 per cent higher on fishmeal rations.

With regard to the occurrence of jaundice [enzootic icterus] the the selenium level of the main plant species in the western mountain Karoo in the Fraserburg district was investigated. It was evident that jaundice could definitely not be ascribed to selenium poisoning. An examination of the chemical composition of the most important veld plants in the south-centralsector of the great Escarpment [from Aberdeen to Somerset East] revealed that there was a deficiency of certain elements in some veld types. Most grasses contain little crude protein, phosphorous and sodium when dry and are extremely fibrous.
Then again most veld plants in the higher-lying parts also contain little molybdenum and the supplementation of copper-containing licks can lead to copper poisoning. A large number of bushes and shrubs which are regarded as being unpalatable contain a large quantity of ether-extractable material, which confirms the supposition that there is a connection between the ether extract content of a bush and its palatability.

The ether extract content may to a very large extent determine the palatability of a veld plant – the higher the ether extract content the less palatable the plant.

In an experiment at the Langgewens Research Station, the early weaning of lambs [lambs weaned at about 20 kg] is being compared with the conventional practice of weaning lambs only at 4 ½ months – a practice which is applied in the cropping regions of the Western Cape. A third group ewes is being used in this experiment to examine the feasibility of having three lambing seasons in two years. Immediately after the early weaning of lambs the ewes are synchronized with teasers and then covered.

The ewes which were subjected to high reproduction demands produced 0,6 kg less wool during the year under review than the other two groups.

The envisaged three lamb crops in two years are not achieved, but four lamb crops are obtained in three years. This is possibly due to the fact that lambs were weaned at a minimum mass of 20 kg and not at a minimum age of 60 days. During the year under review all three groups of ewes lambed in the same season. No difference was noted in the breeding performance of the three groups. Hardly any difference was noted in the growth rates, age at slaughtering mass [roughly 32 kg] and slaughter yields from lambs.

In another project in the Winter Rainfall Region where weaned Merino lambs were subjected to various feeding treatments in order to reach a mass of 37 kg in 6 months the influence of these treatments on their production and reproduction was investigated. The most important result so far is that wethers which reached the above mass in 6 months were already marketable with a carcass mass of 18 kg and were graded as super and first grade. In practice this means that the Merino farmer can dispose of a large part of his lamb crop before the dry summer.

The young ewes were mated at 9 months [in March] and 70 per cent of them lambed at 19 months of age during the peak feeding period. Their lambs were weaned at 3 months to prepare them for the normal mating season commencing at the beginning of January.

This proves again that if the farmer can see to it that the weaned lambs reach the crucial mass of 37 kg [80 lb] within a specific time they can immediately be brought into the production cycle of his flock.

A survey showed that about half the sheep farmers in the Natal Region did not mate their young Merino ewes until the four-tooth stage or later. Investigation at the
Kokstad Research Station showed that a large percentage of the ewe flock did not reach the required mating mass at 18 months of age owing to the poor growth of autumn-born Merino lambs during their first summer on the veld.

In a preliminary trial seven of the fourteen lambs reached a mating mass of 36 kg at 18 months of age. Ninety-five per cent of this mass was gained on grown feeds and only 5 per cent off the veld.

Experiments were initiated to try to boost the growth of these weaned lambs on the summer veld.

Molasses supplementation gave an increased final mass at the end of the grazing season 1.6 kg better than the veld control group, a protein supplement yielded 1.9 kg and a protein and mealiemeal supplement yielded 5.4 kg better than the veld control. Similar ewes on an irrigated pasture produced a mass gain 11.1 kg better than the veld control group, illustrating the potential of Merino lambs to grow when given the right conditions.

Oesophageally fistulated sheep were used at the Kokstad Research Station to sample summer veld. The crude protein of veld samples taken from the fistulated lambs averaged about 8 per cent over the grazing season while grid samples of the veld averaged 5.5 per cent crude protein. These fistulated lambs kept on veld over the winter yielded samples giving crude protein percentages at 6.5 per cent in May to 5 per cent crude protein in early August.

During the same period the grid veld samples yielded 3.4 per cent crude protein in May down to 2.5 per cent crude protein in early August. This illustrates the ability of lambs to select for crude protein, but at the expense of body mass which dropped from 36 kg in May to 27 kg in early August.

GOATS AND MOHAIR

Improved grazing conditions resulted in the winter mohair clip [1971] increasing to 2 152 000 kg [13 047 bales], and also led to the production of a somewhat stronger fibre, generally of good length.

The world depression in the textile industry, the monetary uncertainty and high interest rates were largely responsible for the fact that the average price for the winter season dropped still further to 62.2 cents per kg, compared with 91.8 cents per kg for the winter season of 1970. This represents a decrease of 32.2 per cent in 12 months. Kid's hair, in particular, was severely affected by the fall in prices.

The low prices for the winter season together with the Stock Reduction Scheme, were mainly responsible for a slight drop in the summer mohair clip of 1972 [1 842 000 kg, 11 260 bales].

The most significant trend in the Eastern Cape Region was the increase of Boer goats as well as mutton sheep, at the expense of mohair production. This change-
over was mainly due to better meat prices and was further stimulated by protracted droughts. It is possible that this trend may now be checked by the marked advance in mohair prices.

In the bushveld area of Uitenhage the Angora lambing percentage just after the protracted droughts was only 54.3 and about one-eighth of the kids died before weaning. This caused an imbalance in the composition of the flocks and only 5.9 per cent were under one year old compared with 53.7 per cent of two years and over.

As a result of improved care and feeding, lambing percentages and the percentage of fine hair have increased. The percentage of kid’s hair at the auctions rose from 7 ½ per cent last year to 14 per cent this year. Angora goats have decreased further in number because of the droughts and losses sustained as a result of the floods in August 1971.

The rising prices of meat and the encouraging results obtained by local research into the practical control of bush encroachment, which is on the increase, have led to an increase in the numbers of commercial boer goat farmers in this Region during the past year. Great interest has also been shown in milch-goats.

Many farmers do not class their goats annually as is evident from a survey in the bushveld region of Uitenhage where only 73 per cent of farmers strictly class their Angora goats annually. The very low and unprofitable prices during 1971 led to the injudicious crossing of Angora goats with Boer goat rams.

Conditions have now improved to such an extent, however, that the percentage of Angora ewes in the flocks is generally adequate with a fair to good quality goat.

The improved Boer goat has become very popular in the bush-covered and mountainous areas of the Northern Cape and is increasing in numbers. As regards breeding, the Boer goat has made the greatest progress in the Kuruman and Postmasburg areas. Many rams are obtainable at reasonable prices and farmers use them to upgrade their flocks.

The most encouraging factor here is the good price obtained for slaughter-goats. Cattle farmers with a great deal of bush on their farms utilise the Boer goats to feed on and control the scrub.

In South West Africa goat farming is becoming more and more important in the northern parts. The judicious introduction of goats on cattle farms to reclaim the veld is still increasing.

PIGS

Production
South Africa has less than one quarter of the pigs in Africa, but the South African pig industry produces about 45 per cent of the total pork of the continent. There is, therefore, a large potential sales area for pig meat outside the Republic's borders.

At present about 1 300 000 pigs are slaughtered in South Africa every year. The drop in slaughtering during 1970/71 was out of step with the general tendency during the past ten years when the number of slaughterings doubled and the pig population increased by 72 per cent.

During the year under review the consumption of pork was 3,8 kg per capita, an increase of 0,4 kg per capita during the past ten year.

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National aid schemes

Members of the Pig Improvements Schemes still have an active interest in these schemes, and there are indications that the enthusiasm of the members will steadily grow according as the activities of this section of the Animal and Dairy Science Research Institute are expanded. Moreover, the present prosperity in the pig industry increases the need on the part of breeders for good and specialised services.

During the year under review more attention could be given to specialised service and extension owing to the fact that methods and programmes for the processing of data have reached a final stage. The backlog of work has been brought up to date, in spite of the shortage of staff, and good progress was made with an advisory service to members of the scheme.

Three reports based on the data collected under the various phases of the pig improvement schemes, which indicate some shortcomings in the pig industry, have been completed. Two of these reports have already been distributed and the third, which deals mainly with progeny testing, is at the printers.

A fourth report, similar to the first two, is nearing completion and parts of it have already been distributed among interested parties. These reports are also put to good use by using them as handbooks in specialised extension to expose shortcomings in the industry, and also as a basis for the selection of breeding animals.

Building operations on one of the three new pig testing centres have started and are progressing well. It is expected that the new centre being built at Irene will be completed by December 1972.

The membership of the pig improvement schemes remained constant during the year. There is a possibility that this number will drop slightly during the coming year as a result of the exclusion of breeders who are members of the scheme only for advertising and show purposes.

Boar performance testing scheme
This section of the pig improvement schemes has received considerable attention during the past few years and this is still expanding. The decentralisation of boar performance testing will, judging by enquiries in this connection, awaken even more interest. This decentralisation provides for the testing of boars at Irene, Cedara and Elsenburg.

The number of requests to have been tested increased by 78 per cent from 280 in 1970/71 to 499 in the past year. Owing to the lack of facilities only 170 [34 per cent] of these requests could be accepted. The new testing centres should, however, eliminate this problem.

Attempts will be made to establish stricter qualification standards when the new centres have been completed. Unfortunately, quite a number of inferior boars are tested under the present system, and tested boars are also not systematically used for the improvement of pig herds.

There is no compulsory system by which tested boars can be used to the greatest advantage of the pig population. This is one of the biggest shortcomings of the present system, and valuable genetic material is lost. During a recent survey it appeared that a very small percentage of the boars that successfully completed the test were still in the possession of members of the scheme. Some breeders, who regularly have boars tested, themselves no longer own any of the tested boars.

Of the 170 boars received at the centre, only 132 completed the test. Thirty-four were disqualified at an early stage. Twenty-one of these were disqualified on the grounds of trotter and leg defects, nine for hereditary defects and four on account of poor growth capacity. Of the 132 boars that completed the test, 58 per cent were approved for breeding purposes.

In the following table a summary of the average performance of boars that completed the test is given and compared with the figures for the previous year.

**Average performance of boars that completed the test**

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<tbody>
<tr>
<td>Feed Conversion</td>
<td>2,66</td>
<td>2,67</td>
<td>2,10 – 3,42</td>
<td>2,03 – 3,45</td>
</tr>
<tr>
<td>Average daily gain [kg]</td>
<td>0,71</td>
<td>0,71</td>
<td>0,54 – 0,90</td>
<td>0,56 – 0,91</td>
</tr>
<tr>
<td>C + K fat measurements [mm]</td>
<td>34,4</td>
<td>33,9</td>
<td>29 – 47</td>
<td>25 – 48</td>
</tr>
<tr>
<td>Age test started 30 kg [days]</td>
<td>90,4</td>
<td>93,3</td>
<td>61 – 114</td>
<td>-*</td>
</tr>
<tr>
<td>Age test ended 91 kg [days]</td>
<td>177,1</td>
<td>179,5</td>
<td>143 - 210</td>
<td>-*</td>
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</tbody>
</table>

*These figures were not calculated for 1970/71
Progeny testing scheme

Once again there was a drop in the activities of the progeny testing centres. The average percentage of pen use for the three centres was 44 per cent as against 66 per cent the previous year. Only 54 progeny groups completed the test as against 71 the previous year.

This drop can possibly be ascribed to a very high disqualification figure owing to unsatisfactory farrows, the good prices for breeding animals and pig meat, and to the fact that breeders hold back pigs in order to have them tested by the new procedure.
It would appear that the advantages of progeny testing are not yet fully realised and utilised. During the past year only 14 breeders made use of the progeny testing facilities, viz 5 at Cedara, 6 at Elsenburg and 3 at Pretoria. The percentage of pen utilisation at these three centres was 42.4, 44.19 and 44.7 per cent respectively as against 56.6, 71.0 and 66.2 per cent for the preceding year.

**Pig recording and health scheme**

Slow progress is being made with attempts to make particulars gathered under this phase more reliable. Co-operation among breeders and stricter control by field officers have already brought about a considerable improvement.

In spite of the fact that there was no increase in membership, the number of farrows registered increased by more than 6 per cent. The biggest increase occurred in the Western Cape Region, where 8 per cent more farrows were recorded.

The ultrasonic determination of fat thicknesses was initiated on live pigs in the Free State. Four of these ultrasonic fat meters, of which there is one in each province, are now available to participants in the scheme. The fat thicknesses of 1 000 pigs were determined in this way during the past year.

From the processed data it appears that management ought to be improved on many farms. The average mortality figures of 20 per cent in farrows from birth until three weeks is disquietingly high.

Another aspect that emerged clearly was the high percentage of sows with a term of more than 200 days between farrows, and the detrimental effect of this on productivity. The high percentage of farrows with fewer than six piglets at the age of three weeks and at weaning age also indicates inefficient and uneconomical farming.

**Other measures to promote the production of pork**

The industry imposed a special levy with an annual target of about R100 000 for the promotion of extension, training and research.

The first organised attempt was to appoint two veterinary surgeons and send them overseas for intensive training in pig disease and aspects of production. A start was also made with the erection of larger pig testing facilities costing R193 000.

The bacon carcass competition which was begun in 1959 at the initiative of animal scientists of the Stellenbosch-Elsenburg Agricultural College and which is still held under the guidance of an officer of this college, has proved very popular among pig producers and has already made an important contribution to the improvement of the quality of bacon carcasses in the Western Cape. It is a good example of what can be achieved by co-operation between the college, producers and the industry [bacon factories], and serves as a practical demonstration of the advantages of scientific principles of breeding, feeding and management.
Judging at the competition is based exclusively on objective measurements that are taken and compared from year to year to determine progress.

**Breeding, feeding and management**

The danger of a shortage of fishmeal as protein source in South Africa has stressed the necessity for giving attention to the use of other protein sources as possible substitutes for fishmeal as protein in the ration of non-ruminants. This is why the Pig Research Section of the Animal and Dairy Science Institute is busy planning a project aimed at relieving the pressure on fishmeal as the most important protein source.

This institute has also conducted two trials in order to evaluate a standard pig ration. A complete analysis of the ration and ration constituents was carried out with the aid of chemical analysis and a metabolism trial, while the biological utilisation of the ration was determined by the growth, feed utilisation and carcass composition of pigs in another trial.

Except for a low lysine content observed in the fishmeal, and the amino acid pattern of the wheat bran used, the chemical composition of the ration and ration constituents compares favourably with that obtained by other researchers and also with the accepted standards for a similar ration.

Favourable growth, feed conversion and carcass composition were obtained with baconers to which the standard ration was fed. This information can, therefore, serve as a basis for the determination of feeding standards for pigs in South African conditions.

The quality of pork, i.e. the water-binding property, colour, softness and brine absorption capacity of pig muscles, is to a large extent dependent on the speed with which the degree of acidity increases after death or the pH drops while the carcass temperature is still more than 30°C – i.e. within the first 45 minutes after death. Should the pH value be lower than 6,0 the above-mentioned quality characteristics of the muscles are very adversely affected and this causes serious losses to the bacon manufacturer, the retail butcher and the seller of consumer cuts in chain stores.

Research at the Institute showed the method of stunning during the pig slaughtering process may have a profound influence on the pH₁ value. It was established, for instance, that the captive-bolt pistol method leads to extreme muscular contractions and causes a very low pH₁ value, as against electrical stunning that does not affect the pH₁ value to the same extent.

The most significant result obtained in a survey at the bacon factories and three abattoirs is that 71,9 per cent of the carcasses at one abattoir had pH₁ values of 6,0 and lower and could thus be classified as the internationally known pale, soft and watery [PSW] pork. The detrimental effect of the captive-bolt pistol on the quality of meat at this abattoir thus confirms the comparative observations at the Institute.
Among the centres where electrical stunning was being applied, the largest number of PSW carcasses was being applied, the largest number of PSW carcasses was encountered at one bacon factory. In this case it was established that the delay in the process of gutting found here – as long as two and a half hours after death – was the most important reason for a high percentage of PSW carcasses.

Histological examination of muscle samples of PSW and normal muscles of baconers brought many interesting facts to light. During the rapid drop in pH after death the muscular protein is considerably damaged. The cell membranes of the muscle fibres, which to a considerable degree consist of connective tissue, are damaged to such an extent that they become more permeable to cell fluid. As a result of the movement of cell fluid from the intra-to the intercellular spaces, the muscle fibres shrink.

In this way statistically significant differences in size were found between normal muscle fibres and PSW muscles of baconer carcasses.

Experimental work is being done in the Winter Rainfall Region to synchronise the oestrous cycles of young sows with a view to artificial insemination and to increase the production capacity. Preliminary results indicate that a considerable increase in the number of foetuses can be achieved with PMS [pregnant mare serum] after synchronisation with methallibure.

The advantages of artificial insemination in respect of herd improvement, disease control and crossing are as obvious for pigs as they are for other animals. In trials at present being carried out at Elsenburg, oestrus and ovulation of young sows is being controlled by means of hormones and synthetic hormone preparations to such an extent that the correct moment for insemination can be determined. Attention is being paid to the technique of artificial insemination with pigs.
Production trends

During the year under review the Egg Production Control Act, 1970 [Act 61 of 1970] started having an effect, although the full results will be noticeable only over a number of years. Owing to the capital needed to utilise the permissible extension, it usually takes 12 to 18 months before production is really influenced.

Owing to the rise in the general cost structure there is a tendency for the turnover to increase, and consequently the units are steadily becoming bigger. Organisations with enough capital show the biggest expansion by taking over private farming concerns.

The efficiency of egg production units is already very high and egg prices are low in comparison with other foods. The rapid rise in the costs of poultry rations, chiefly owing to the higher prices of animal proteins and maize, means that more attention will have to be paid to alternative sources for poultry feed.

There is, however, a healthy increase in production as well as consumption of eggs.

National aid schemes

Eight breeders with 20 entries competed in the random sampling egg-laying test at Glen. This test was completed on 4 February 1972. A hen-housed average of 240,7 eggs with a feed conversion of 2,69 was achieved. This result is the best year achieved on a local random sampling test and is even better than is achieved in overseas tests.

The tenth random sampling broiler test was concluded on 21 September 1971. Eight pens, each consisting of 120 broilers, competed. At 64 days the chicks reached an average mass of 1,952 kg with a feed conversion of 2,33.

The funds for the erection of facilities for the random sampling egg-laying test at Irene were provided by private fowl farmers and the Egg Control Board. The first test, supported by 22 breeders with 39 pens, was concluded in February 1972. A hen-housed average of 204,05 eggs with a feed conversion of 2,74 was achieved.

Other measures to promote the production of poultry and eggs

The White Plymouth Rock and White Cornish strains which were imported during 1962/63 by the Department are being kept pure by the Animal and Dairy Science Research Institute for the distribution of fertilised eggs to poultry farmers. A breeding programme with a strong selection pressure is being applied to improve the meat and egg characteristics of these fowls. Turkey toms as well as 420 day-old poults of the two white strains of imported turkeys were sold to the farmers.
On the Institute's farm at Irene a quarantine station was erected for use by private breeders for the importation of broiler breeding material from overseas. A private concern has also erected a quarantine station for the importation of turkey breeding strains on this farm.

The three imported strains of White Leghorns at the Institute are used in a breeding programme to improve economic characteristics. During the year under review surplus cocks and 300 dozen fertilised eggs were sold to farmers. In addition 10 290 dozen hatching eggs were delivered to Onderstepoort for the production of serum against Newcastle disease and rabies.

The development of a table-bird with a sex-linked silver colour has reached a stage in the Natal Region where cross-breeding is now being carried out with a view to comparative studies.

The female progeny, obtained by crossing this silver strain with White Plymouth Rocks, will be a foundation strain for the production of broilers. It can thus be considered an artificial foundation strain for the production of day-old chicks and will be compared with the Plymouth Rock hens, which are generally used for this purpose.

The masses that these chicks have reached by eight weeks [artificial foundation strain] compare very well with the average mass of Plymouth Rocks at the same age. The chicks are now being raised further so as to compare egg production, which is expected to be the most advantageous characteristic, with the egg production of Plymouth Rock mothers.

In the Transvaal Region the genetic environmental and phenotype of egg production with egg mass, body mass and age at sexual maturation of hens have been determined. The influence of the above-mentioned physiological factors on egg production has been determined, and general recommendations have been made concerning the application of the results to farmer's breeding systems. The conclusions are of inestimable value to the poultry farmers.

The importance of the maintenance of pure and inbred poultry breeds is steadily increasing as a result of the demand for this breeding material for the production of commercial meat and egg-producing strains. For this reason the effect of inbreeding on poultry has been investigated in respect of characteristics like egg production, fertility, body mass, egg mass and hatchability.

Of great importance is the fact that it has been determined that the hatchability of the eggs of the inbred strain has increased tremendously as a result of the provision of additional vitamins. It has been determined that an autosomal recessive gene is responsible for a shortage of riboflavin in the egg and consequent high embryo mortality.
All imported breeding material for broiler breeding, viz the two parent breeds [White Cornish and White Plymouth Rock], three strains of White Leghorns and two strains of white turkeys were included in breeding programmes at the Animal and Dairy Science Research Institute for improved economic characteristics.

A special strain of Rhode Island Red is also being bred to serve as parent strain for a commercial egg producer where the sex of the day-old chick can be determined according to the colour of the down.

**Feeding**

In a trial on the influence of feed limitation during the growth period on the performance of hens receiving different levels of energy and protein, it was found that the feeding of a ration with a low protein level was more efficient than limiting consumption by providing a complete growth mash every second day.

There were indications that eitriphin had an advantageous effect on the start and duration of the moulting period in conditions of natural length of daylight.

**Forced moulting among layers** – By withholding water for two days and food for 14 days the hens were made to start moulting. After this the hens were again placed on normal feeding. The first hens again started producing 28 days after the beginning of the withholding.

This work is being continued in order to determine whether it would not be more economical to let hens go through a moulding period after the first year of laying and then to achieve production for a second year rather than replacing the hens with young hens every year.

The feeding of growing broiler breeding hens is being investigated in the Natal Region. A research project on feed limitation of these chickens has been completed. Various protein and energy level treatments were used to retard mass gain at the age of sexual maturation. Carcass analyses were carried out at three developmental stages for these hens.

Although attempts to control the body mass with feeding were unsuccessful, the fat content of the hens could be controlled. The fat content of the hens was dependent on the intake of energy and was lower among hens that received rations with low energy or high protein. It led to a lower energy intake.

It is generally known that a high fat content in the carcasses of hens has a detrimental effect in terms of production capacity and mortality. Gradually decreasing the protein level of rations during the growth period could, to a certain extent, limit body mass at lower energy levels, while the opposite was observed at higher energy levels.

An important finding of great economic importance for the poultry industry is that higher levels of vitamin A in the feed lessen the intensity of coccidiosis, one of the most important poultry diseases.
Complaints were received from overseas buyers that the yolk colour of South African eggs was unsatisfactory. Research done by the Department of Poultry Science, University of Pretoria, proved that synthetic pigments can be used to improve the yolk colour.

**WATERFOWLS**

In an experiment at the Cedara College of Agriculture the use of artificial light to stimulate out-of-season egg production in Chinese geese is being investigated. Geese normally lay in spring and this tendency does not allow the goslings to be ready for the Christmas market. If geese could be brought into lay earlier the goslings would reach market age about 16 weeks before Christmas. The experiment showed excellent results in the past year and is being continued for another year.

In another research project methods of reducing the high fat content of ducks by methods of crossing and feeding are tested. The fat content of ducks obtained by crossing with the muscovy was shown to be much lower than that of the pure Pekin.

**OSTRICHES**

From trials in the Winter Rainfall Region it appears that young ostriches, easily take in a mash and show satisfactory mass gains. There is thus a possibility of establishing feeding requirements with greater certainty.

Good progress is being made with the provision of facilities so that ostrich research can be undertaken in a wide field.

**HORSES**

**Nooitgedacht pony**

The good progress made with the breeding of the Nooitgedacht pony from the Basuto pony can be seen from the number of daughter studs [19], the number of breeding animals [180] and the fact that a breeders society was formed in 1969 with the aim of having the breed registered in the Pedigree Register.

The very good temperament, hardiness and average size of the Nooitgedacht pony make this horse a good farm saddlehorse, as well as a popular child’s pony. The horse has proved itself at many shows.

**Percherons**

At Elsenburg the horses in the Percheron stud are used for research into the sexual physiology of the horse and the feeding requirements of young growing horses.

In these trials it became evident that it is quite possible to make up a completely pelleted ration on which foals can be raised successfully from weaning to the age of
one year without grazing and on which they grew 12 per cent faster than comparable foals on the same feed but in the usual non-pelleted form.
Over the three years of the trial the average birth masses, weaning and one year masses of colts and fillies on pelleted feed were 72 and 66 kg, 355 and 340 kg, and 497 and 485 kg respectively.

The abnormal oestrous cycles of mares early in the breeding season present breeders with a difficult problem. Good results were achieved by using exogenous progesterone in the treatment of the abnormal cycles.

2. VETERINARY SERVICES

INTRODUCTION

During the year under review a number of posts in the stock inspection branch of the Division were abolished and transport allocations curtailed. This created great difficulties in maintaining the efficacy of the all-important function of keeping a watchful eye on the stock disease position throughout the Republic at all times, while at the same time controlling serious outbreaks of disease.

Responsibility for the Central Veterinary Investigation Centre at Onderstepoort was transferred from the Division of Veterinary Services to the Research Institute. The Regional Veterinary Investigation Centres were limited to the three at Allerton, Stellenbosch and Middelburg [Cape] in the Republic, and the one at Windhoek in South West Africa.

Outbreaks of sheep scab occurred in one district of the Highveld Region, seven districts in Natal, in the Eastern Transvaal and Winter Rainfall Regions in two districts each, and in three districts in each of the O.F.S. and Transvaal Regions.

Appreciable progress was again made with the bovine tuberculosis eradication scheme. Compared to the 2 084 herds at the end of the previous report year, there are now 2 899 herds participating in the scheme.

The foot and mouth disease position in the Republic remained satisfactory. The infection in game in the Kruger National Park, referred to in the previous report, was still prevalent during the latter half of 1971, but gradually subsided. Any serious extension of infection to the adjacent stock farming areas was prevented by continued intensified patrolling of the game proof fence on the borders of the Park, maintained vigilance by means of intensified stock inspections and the preventative vaccination of all susceptible stock in these areas.

The research activities of the Institute progressed satisfactorily and, although no spectacular “break-through” was made, valuable results were nevertheless obtained.

On 1st July 1971 there were 145 registered projects at the Institute. A further 28 projects were registered during the year while 19 were terminated. During the period under review 76 scientific articles were published.
Continued studies on the duration of immunity in cattle after experimental inoculation against besnoitiosis [elephant skin disease] revealed that the immunity after two years was as good as after one year. With this information at our disposal, as well as the results of experiments to determine a practical vaccine dose, the vaccine will now be registered and should be available for general use during the following year.

Promising results were obtained in the treatment of bilharzia in cattle with a cheap organic phosphate and a survey of the seasonal incidence of round worms in sheep in the Eastern Free State gave valuable information which should contribute towards the more effective control of these parasites. Methods have been evolved to evaluate the efficacy of worm remedies in cattle and standards of efficacy for such remedies have been established.

In the previous annual report is was mentioned that the disease “facial eczema”, which is caused by a fungus, was also diagnosed in the Republic for the first time, and that attempts were being made to grow the fungus artificially in order to study the effect of the toxin. Although the fungus can be grown artificially with relative ease, the yield of toxin was limited.

After considerable research it was found that ultra violet light irradiation increased the toxin production of fungus cultures remarkably, which facilitated the artificial production of cases of facial eczema with these cultures. This enabled the research workers to study the disease closely and to compare it with natural cases of “geeldikkop”. There is a suspicion that “geeldikkop” is also caused by a mycotoxin and, although suspected fungi have been found on pastures, the syndrome could not be produced artificially up to the present.

In the previous annual report it was mentioned that progress was made with the cultivation of the heartwater organism in laboratory host systems. Further research has since shown that either the organism cannot be grown in sufficient quantities, or is altered to such an extent that its use as a vaccine is not practicable. It is therefore apparent that the possibility of producing a safe and effective vaccine against heartwater is not yet within reach and further research in this direction is still necessary.

The most important occurrence during the past year was the diagnosis and confirmation of *chlamydiosis* as a cause of extensive abortions in sheep in the Republic. This disease, occurring overseas in enzootic from called enzootic abortion, appeared throughout the country causing extensive economic losses. Research workers at the Institute determined that, not only did the organism cause abortions in sheep, goats, cattle and horses, but that it was also responsible for poor growth, nervous symptoms, pneumonia and mortality in young lambs.

Although the disease was only diagnosed and confirmed for the first time during this year, it is suspected of having been present in this country for several years in enzootic form, but that conditions for the disease were favourable, leading to its explosive appearance during this year.
The opinion of farmers that bluetongue vaccine produced by the Institute, was responsible for spreading the disease has been proved to be wrong by intensive investigations.

The only way enzootic abortion in sheep can be controlled is by means of vaccination. In addition to extensive diagnostic work and a study of the organism, a team of research workers at the Institute are engaged in developing a vaccine against the disease, which it is hoped will be issued early in 1973.

By the addition of two new vaccines viz. Infectious bronchitis in poultry and HEP vaccine against rabies in cats, the number of vaccines produced and issued by Onderstepoort have now been increased from 30 to 32. The total number of doses of vaccine issued showed a phenomenal increase from 112 million in the previous year to 128 million during the year under review.

During the past year considerable progress has been made in research concerning the technology of vaccine production. For many years problems were encountered in the successful application of the WHO efficacy test to rabies vaccine – a problem also experienced by other laboratories. The test is based on the immunization of guinea pigs with a certain vaccine batch and then challenging these animals, together with unvaccinated controls, with a standardised dose of natural rabies virus. The problem was that the vaccine did not attain the requisite standard of efficacy, unless the challenging dose was sufficiently increased to kill a satisfactory percentage of the control guinea pigs. By the addition of a mucolytic enzyme to the challenge material the problem was solved and a scientific break-through established.

In the field of technology success was also attained with the production of distemper vaccine in an established tissue culture cell line instead of in incubated eggs. Not only did this save a lot of labour, but the quality and viability of the vaccine was also enhanced. The experimental work in connection with an oil adjuvant vaccine against botulism [lamsiekte] was also completed and this improved vaccine will be available shortly.

Research on a vaccine against vibriosis has progressed very satisfactorily. A trivalent, inactivated, water-in-oil emulsion experimental vaccine gave effective protection to heifers against artificial infection. More important, however, was the fact that infected heifers lost the infection two to three weeks after vaccination. This same therapeutic effect was also observed in infected bulls. Technical problems in connection with the production of this vibriosis vaccine are now being attended to.

The standards of safety and efficacy of Onderstepoort vaccines have been reviewed during the year and considerably improved. Certain test procedures have been modified and new procedures introduced in order to meet these requirements.
NOTIFIABLE DISEASES

Foot and mouth disease

No outbreaks of foot and mouth disease occurred outside the Kruger National Park, except one case in an impala in a private game reserve in the Pilgrim's Rest district and one outbreak amongst 9 cattle in a game camp on a farm in the Barberton district. To limit infection in the latter case, 25 pigs were destroyed and R400 compensation paid.

As a precautionary measure 232 505 cattle, 13 492 sheep and 110 568 goats were immunised in the areas contiguous to the Kruger National Park, using an inactivated, trivalent vaccine which affords protection against all three South African types of foot and mouth disease virus – SAT1, SAT2 and SAT3.

In the previous report reference was made to infection in game in the Kruger National Park. During the latter half of 1971 infection was still prevalent, but gradually subsided thereafter.

To minimise the risk of the spread of infection through human agency, strict measures were enforced throughout the year within the Park. In connection with game animals slaughtered during culling operations, veterinary inspections were carried out of all carcases, as well as veterinary supervision of the transport of carcases to the abattoir and the pre-treatment of loads of fresh hides and skins before long-distance transport within the Park. To prevent the possibility of the spread of infection beyond the borders of the Park, cooking and chemical or other treatment of all animal products, prior to removal from the Park, was supervised by officials of the Division.

Further measures to protect stock farming areas from foot and mouth disease included short interval stock inspections in the areas adjoining international borders and the Kruger National Park, as well as regular patrol and repair of fencing on international and Kruger National Park borders.

As a result of border patrolling 34 cattle, 5 sheep and 43 goats found straying or illegally introduces from adjacent territories, were impounded. Of these, 11 cattle and 3 goats were returned to Botswana on payment of a total of R73 herding fees, while the rest of the animals, valued at a total of R1 248,50, had to be destroyed.

Rabies

During the period 1st July 1971 to 30th June 1972 a total of 1 989 specimens were submitted to the Rabies Section, Onderstepoort, for examination. Of these 450 [22.5 per cent] – this figure includes 73 from S.W.A. – proved positive, with the species distribution as follows:

48/…
Meercats 261
Cattle 97
Dogs 25
Domestic cats 15
Jackals 14
Sheep 4
Horses 3
Wildcats 1
Humans 1
Other animals 29

The significant increase – 1 260 – over the number of specimens submitted during the previous year is due, in part at any rate, to the public hysteria following the protracted illness and eventual death of a young girl in the O.F.S. after anti-rabies therapy. This case had received extensive press and radio cover.

A second contributory factor is the marked rise in the reported cases of rabies in certain wild life species, although this may have been influenced to a certain extent by the hysteria mentioned above.

The annual immunisation of dogs in the declared rabies areas in Natal and the Transvaal, and the vaccination of all dogs within a 15 – 25 km radius around confirmed outbreaks were carried out during the year. A total of 341 136 dogs and 13 889 cats were immunised.

The destruction of meercats by mobile units in heavily infected areas in the Highveld and O.F.S Regions continued during the year. Eradication was undertaken on 333 farms [161 899 ha] and 47 239 colonies and 15 441 single holes gassed.

**Anthrax**

During the year 10 cattle and 1 sheep died in 10 outbreaks of anthrax on farms in the Republic. A total of 6 136 184 cattle, 176 075 small stock and 8 723 horses were vaccinated by or under supervision of officers of the Veterinary Division. Taking into consideration the fact that so many of these officers were absent from their areas on campaign duties for lengthy periods, the figures for precautionary immunisation are very satisfactory.

Since the 1970 outbreak of anthrax in the northern parts of the Kruger National Park, all anthrax carcasses found have been incinerated in an attempt to minimise the sources of infection. It would appear that this has led to an improvement, since the disease this year claimed only 2 roan antelope, 3 kudu, 1 buffalo, 2 steenbuck, 1 nyala and 1 impala.

As the roan antelope appears to be especially susceptible to anthrax, an experiment was launched to immunise animals of this species, using a helicopter and darts which also effectively mark vaccinated animals. In this way 89 roan antelope were
immunised. At the moment expenses are high –R14 per animal – but it is hoped to bring this down by modification of the modus operandi.

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**East Coast fever and related diseases**

East Coast fever was eradicated in 1954. In the formerly affected areas continued vigilance is maintained, and spleen smears are collected for laboratory examination from the highest possible percentage of cattle that die or are slaughtered in these areas. A total of 295 029 smears were examined during the year.

The fencing of the eastern and western boundaries of the Corridor, which prevents contact between cattle and the buffalo in the reserve, it probably responsible for the fact no cases of buffalo disease *Theileria lawrencei* occurred.

Benign bovine theileriassis *T. mutans* was diagnosed in 42 cases. These outbreaks were controlled by short periods of quarantine and intensified tick control measures.

**Tuberculosis**

A total of 1 611 certificates was issued to tuberculosis free herds during the year under review and at the end of the period 2 899 herds were participating in the eradication scheme, compared to 2 084 the previous year.

During the financial year ending 31st March 1972 566 herd tests were done on 412 infected herds. In these herds 102 922 animals were tested and 5 722 found positive, giving an incidence of infection of 5,57 per cent. Of the 412 infected herds, 35 that are heavily infected are being given Isoniazid [INH] treatment.

During the financial year 4 281 positive reactors were slaughtered and R453 766 compensation paid by the State. The sale of carcase not condemned at the abattoir realized the sum of R234 484, so that 51,6 per cent of the compensation paid was recovered.

Test and transport fees paid to private veterinarians in respect of tests carried out on behalf of the State came to R163 652. A further R21 000 for INH and ear tags brought the total expenditure on the scheme during the financial year to R638 418.

As the end of the year under review 230 private veterinarians had contracted to undertake testing on behalf of the State.

Since the launching of the eradication scheme on 14 May 1969, 139 herds previously infected have qualified for tuberculosis-free certificates.

An indication of the areas, where the heaviest infection was found, is given by the numbers of reactors slaughtered at the various abattoirs: Newtown [Johannesburg] 1,834, Maitland [Cape Town] 1 453, Port Elizabeth 260, Pretoria 212, East London 168, Pietermaritzburg 128, Kimberley 89, Durban 83 and Bloemfontin 33.
A summary of the tests carried out during the year under review is given below:
<table>
<thead>
<tr>
<th>Test</th>
<th>Number of herds</th>
<th>Number of tests</th>
<th>Positive</th>
<th>Suspected</th>
</tr>
</thead>
<tbody>
<tr>
<td>INH.</td>
<td>19</td>
<td>9 163</td>
<td>566</td>
<td>146</td>
</tr>
<tr>
<td>Import and export</td>
<td>289</td>
<td>9 796</td>
<td>1</td>
<td>-</td>
</tr>
<tr>
<td>Diagnostic</td>
<td>442</td>
<td>28 246</td>
<td>112</td>
<td>56</td>
</tr>
<tr>
<td>Interim</td>
<td>1 152</td>
<td>215 080</td>
<td>1 915</td>
<td>1 038</td>
</tr>
<tr>
<td>Accreditation</td>
<td>1 845</td>
<td>235 791</td>
<td>2 053</td>
<td>663</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>3 747</strong></td>
<td><strong>498 076</strong></td>
<td><strong>4 647</strong></td>
<td><strong>1 903</strong></td>
</tr>
</tbody>
</table>

Compared to 1970/71 the total of tests carried out shows an increase of 94 511. Excluding tests under the accreditation scheme, the incidence of reactors is 0,99 per cent positive and 0,47 per cent suspected.

Losses due to the condemnation of pig carcases at abattoirs did not assume the same proportions as in previous years.

Only two outbreaks of avian tuberculosis were reported during the year, both in the Winter Rainfall Region.

**Brucellosis**

On 13 December 1968 the scheme for the official vaccination of heifer calves between three and ten months of age, and the distinctive marking of all such calves, was launched. As in the preceding two years, no gratifying progress under this scheme can be recorded for the year under review. A full-scale vaccination effort could not be maintained because of the campaign requirements of the Division and also the restrictions on transport allocations of inspectorate personnel.

At the Onderstepoort and Regional Investigation Centres the following serological tests for brucellosis were carried out:

<table>
<thead>
<tr>
<th>Species</th>
<th>Number of tests</th>
<th>Positive</th>
<th>Suspected</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cattle</td>
<td>73 904</td>
<td>9 965 [13,5%]</td>
<td>2 562</td>
</tr>
<tr>
<td>Sheep</td>
<td>5 585</td>
<td>626 [11,2%]</td>
<td>121</td>
</tr>
<tr>
<td>Goats</td>
<td>100</td>
<td>4 [4,0%]</td>
<td>-</td>
</tr>
</tbody>
</table>

During the year Onderstepoort issued 1 447 605 doses of Strain 19 and 421 350 doses of Rev. 1 vaccine. A total of 1 071 060 cattle and 5 610 sheep were vaccinated by or under supervision of officers of the Division.

At the Research Institute the immunogenic and agglutinogenic properties of three vaccines – Onderstepoort S19, Onderstepoort 45 – 20 killed oil emulsion vaccine, and a non-agglutinationogenic French vaccine [PB], are being investigated in cattle.
PB vaccine has excellent non-agglutinogenic properties, whereas the oil emulsion vaccine is only slightly less agglutinationogenic than S19. Although the experiment is still in progress it is already obvious that the PB vaccine has provided little protection while S19 induced a good immunity.

Vaccinated and exposed animals in the above experiment have also been used to investigate the various diagnostic serological tests. As a result of these investigations it appears likely that the simpler mercaptoethanol or Rivanol tests could be used in place of the technically more difficult complement fixation test.

The Rose-Bengal plate agglutination test is being investigated on sera from the above experiment and on routine specimens received at Onderstepoort. Initial indications are that the test will find application as a rapid and reliable screening test.

Trypanosomiasis

Nagana

During the year under review no cases of nagana were diagnosed in the Republic of South Africa, while positive cases were known to have occurred in certain localised areas in the Eastern Caprivi. The annual spraying operations were continued in Macambique as well as in the Caprivi tsetse fly complex.

For the first time since commencing spraying operations in 1962, it was not necessary to spray in Rhodesia south of the Sabi River. The 1971 spraying operations were confined entirely to Mocambique in terms of the recommendations of the Interterritorial Committee for the Control of Tsetse and Trypaosomiasis in South-East Africa that these operations be essentially directed to consolidate the progress far made.

Five spraying teams for the months of July and August 1971 and 3 spraying tams for September 1971 covered an area of 715 km², where a total of 5 917 km of parallel lines, riverines, valleys and contacts were sprayed, using 164 678,50 litres of a 5 per cent DDT wettable powder. A total of 10 955 kg of 75 per cent DDT wettable powder was used during this campaign. Senior Technician to control and co-ordinate the campaign as a whole, three officials to supervise spraying units, five 3-ton lorries with drivers, two Land Rovers, spares for spraying pumps and 120 drums of diesoline fuel for opening up access roads.

The financial contribution towards the campaign was as follows:

<table>
<thead>
<tr>
<th>RSA</th>
<th>Rhodesia</th>
<th>Mocambique</th>
</tr>
</thead>
<tbody>
<tr>
<td>R13 107</td>
<td>$4 455</td>
<td>849 569 Esc. [± R21 238]</td>
</tr>
</tbody>
</table>
The results of the 1971 spraying operations that are already available make it clear that the first phase of the spraying operations, originally planned to cover a period of ten years from 1962, has come to a satisfactory conclusion. On the basis of results obtained from traffic control points, cycle fly rounds, bait ox surveys and test herds, it can now be claimed with confidence that a total area of 10,950 km², including 5,250 km² on the Mocambique side of the international border, has been freed from the tsetse fly. The tsetse fly therefore has been eradicated from all parts of the Rhodesia side of the Mocambique border, south of the Sabi River, and also from all territory on the Mocambique side up to a depth of at least 60 km east from the Rhodesia border and south of the Rio Save.

The total costs of the first place of this project amounted to R508,965 of which Rhodesia contributed R196,319, the Republic of South Africa R170,393, and Mocambique R142,253.

As an essential measure the immediate task of the Interterritorial Committee, in planning the second phase of the project, is to hold the country which has been reclaimed up to the present Massengena-Cheagamane road and to ensure that no land be lost to the tsetse fly in a southerly direction to the east of the line.

*The Caprivi Tsetse Fly Complex*

In accordance with the agreement arrived at the meeting held at Windhoek on 17 – 18 March 171 by representatives from the Republic of South Africa, Angola and Botswana, three spraying teams were again made available by the Republic and four spraying teams by Angola. Owing to other commitments in certain priority areas, and limited supplied of insecticide it was not possible for Botswana to continue spraying operations along the western banks of the Chobe river.

The change-over from dieldrin to DDT wettable powder in 1970 gave rather disappointing results. The fly density increased in certain areas, followed by an increase in the incidence of sleeping sickness. It was therefore decided that dieldrex 15T again be used for the 1971 spraying operations. A total of 2,800 litres dieldrex T15 concentrate was used in Eastern Caprivi and 8,600 litres in Western Caprivi and adjoining areas of Angola. No spraying was done towards the south in Botswana.

The total costs of the campaign for the three South African spraying teams amounted to R18,630.

No spraying operations were undertaken in the Bwabwata area for the second year in succession and the indications are that this area has been reclaimed and is free from *Glossina morsitans*. Surveys will be conducted to ensure that no land is to the tsetse in this area.

The position in Zululand remains unchanged and no cases of trypanosomiasis were diagnosed amongst cattle in areas adjoining the Umfolozi, Hluhlwe, Mkuzi and Ndumu Game Reserves.
Dourine

During the year 1 458 serum specimens were examined at Onderstepoort 1 138 of which came from plans in the Republic and 320 from plans beyond our borders.

The distribution of the 32 positive South African cases was as follows: Benoni [1], Christiana [1], Potchefstroom [5], Potgietersrus [1], Pretoria [1], Rustenburg [1], Mafikeng [3], Vryburg [3], Natal [9], the Transkei [7].

The positive reactors within the Republic were all either castrated or destroyed.

Details of the specimens from outside the Republic are listed below:

<table>
<thead>
<tr>
<th>Country of origin</th>
<th>Number of specimens</th>
<th>Number positive</th>
</tr>
</thead>
<tbody>
<tr>
<td>South West Africa</td>
<td>166</td>
<td>15</td>
</tr>
<tr>
<td>Rhodesia</td>
<td>103</td>
<td>0</td>
</tr>
<tr>
<td>Swaziland</td>
<td>24</td>
<td>0</td>
</tr>
<tr>
<td>Botswana</td>
<td>17</td>
<td>1</td>
</tr>
<tr>
<td>Zambia</td>
<td>4</td>
<td>0</td>
</tr>
<tr>
<td>Lesotho</td>
<td>3</td>
<td>0</td>
</tr>
</tbody>
</table>

Lumpy skin disease

Only sporadic outbreaks of lumpy skin disease, with low morbidity and a very mild course, were recorded.

320 538 doses of vaccine were issued by Onderstepoort, which is only slightly less than the previous year.

Sheep scab

Sheep scab was recorded in 6 of the 7 Veterinary Regions of the Republic, with outbreaks diagnosed on 54 farms and 2 Bantu areas in the following 18 magisterial districts:

Sasolburg [4]; Babanango [6], Dundee [3], Newcastle [4], Nkandla [Bantu area], Nqutu [Bantu area], Utrecht [2], Vryheid [2]; Lydenburg [8] Pietersburg [2]; Gordonia [4], Kenhardt [3], Kuruman [1]; Belfast [3], Benoni [1], Pretoria [2]; Calvinia [7], Vredenburg [2].

A total of 197 110 head of small stock on infected and contact farms were dipped under official supervision at least twice at 8 to 10 day intervals.

In the majority of cases the source of infection could not be established. Owing to the large number of vacancies in tock inspectorates and the temporary absence of many officers from their normal spheres of duty, infections were not always discovered at an early stage. This almost invariably made the tracing of the source of infection impossible.
During April-June 1972 research workers from Onderstepoort undertook trials in Dundee and Newcastle districts to find a suitable substitute for BHC, the only approved dip against sheep scab. These observations have shown that one of the three organic phosphate sheep dips tested, gave excellent results against the parasite concerned, *Psoroptes communis ovis*. One dipping at 500 p.p.m. gave complete control, but two dippings at this strength were recommended for general purposes.

**Mange**

Sporadic cases of mange in cattle, goats and pigs were recorded, as shown below. All cases readily responded to appropriate treatment.

<table>
<thead>
<tr>
<th>Species</th>
<th>Outbreaks</th>
<th>Number of Animals affected</th>
<th>Animals on farms</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cattle</td>
<td>38</td>
<td>427</td>
<td>50 682</td>
</tr>
<tr>
<td>Goats</td>
<td>48</td>
<td>5 637</td>
<td>60 379</td>
</tr>
<tr>
<td>Pigs</td>
<td>19</td>
<td>137</td>
<td>1 514</td>
</tr>
</tbody>
</table>

In the Witsieshoek Bantu Reserve in the O.F.S., 401 horses were dipped as a precautionary measure.

In the Kruger National Park mange was observed throughout in various species. *Sarcoptes scabiei* could be transmitted artificially only to the buffalo and steenbuck. It was found that the buffalo as well as the blue wildebeest can be asymptomatic carriers of sarcoptic mange.

**Swine fever**

Classical swine fever does not occur in the Republic and no cases of African swine fever were recorded during the year.

Warthogs and bush pigs – potential carriers of African swine fever – are found in a limited portion of the Northern and Eastern Transvaal, which has accordingly been declared a swine fever control area. Measures applied here include strict control of the movement of pigs and pork products within and out of this area. Only pigs from approved piggeries, which conform to certain specifications and are subject to regular inspections, are allowed to be moved out of the control area, and then only to specified quarantine abattoirs from which no meat products may be allowed to enter the export trade.

During the year a survey was launched in the Potgietersrus State Veterinary Area to investigate the presence of African swine fever virus in tampans found in warthog burrows. Infection was found on two farms in the area.
Swine erysipelas

During the year 18 outbreaks of erysipelas were recorded, one causing the death of a dolphin in the Port Elizabeth Oceanarium. In all cases infection yielded readily to antibiotic treatment.

Epizootic lymphangitis

No cases of this disease occurred during the year.

Johne’s disease

Four cases, all in imported bulls, were recorded, one each in the districts of Ladybrand, Krugersdorp, Pretoria and Thabazimbi. The four farms involved, as well as those on which cases occurred in previous years, are being watched for any further developments.

The Natal Region indicates that the Swaziland veterinary authorities have reported Johne’s disease in a cow imported from a farm in the Hlabisa district. Infection was found on this farm some years ago after the introduction of an imported bull from the Pietermaritzburg district. The position on both these farms is being closely observed.

Infectious laryngotracheitis

Four outbreaks were confirmed in the Winter Rainfall Region. A total of 991 823 chicks were vaccinated experimentally during the year, and no severe reactions noted.

Rinderpest

This disease does not occur in the Republic of South Africa or any of its neighbouring territories.

Newcastle disease

In the previous report it was indicated that in view of the world-wide incidence of Newcastle disease and the situation in the Republic the policy of slaughter of infected flocks and official vaccination of poultry at risk was suspended on 13 January 1971, while the sale of Kamarov vaccine to all poultry farmers for the protection of their stock was authorised. Also referred to was the decision on 18 February 1971 to permit the importation of water-soluble vaccines for use by owners to protect young stock.

During the year under review no policy changes were introduced. The recommendations for immunisation regimes for breeding, egg production and broiler plants were, however, adapted to ensure optimum results, in the light of experience gained in the large-scale use of the available vaccines.
The disease position did not improve during the period under review and there were widespread outbreaks, only the Cape East and Karoo Region remaining free of infection.

At the end of the year under review the position is that outbreaks are encountered mainly in small poultry holdings and backyard flocks not protected by the recommended vaccination programmes, but also in some larger establishments in similar circumstances.

At the Research Institute the evaluation of immunity in young chicks after inoculation with lentogenic vaccine virus [i.e. similar to drinking water vaccines eg. Lasota and B1 strains] has been done and it was concluded that with chicks under four weeks old great problems are encountered in attaining an efficient immunity.

The most important findings were that day-old chicks immunize poorly. Passive immunity in chicks from Komarov strain vaccinated parent stock is sufficient to risk delaying vaccination till 5 to 7 days old when a considerably better immunity is conferred. This is now recommended as standard practice.

Chicks which are thereafter inoculated with Komarov vaccine at about 4 weeks of age show no reaction, but immunize well and only require a further Komarov vaccination at 16 weeks of age.

In broiler chicks the same problem was encountered with day-old immunization. Immunization at 7 days of age is regarded as practical in large broiler establishments.

Lasota vaccine by the intramuscular route was tested, because these types of vaccines are weaker than Komarov. This vaccine is normally not injected, but applied to the mucous membranes. In trials with tens of thousands of broiler chicks it was found that chicks inoculated intramuscularly with triple strength Lasota vaccine at 18 days old developed an excellent immunity which lasted till at least 9 weeks old. The practicability of these findings is being investigated.

Komarov vaccine gives the best immunity against prevalent, virulent, natural strains and when administered as prescribed no vaccine reactions are encountered. Komarov vaccine also has a “blocking” effect when administered on a farm where birds are dying from Newcastle disease. Mortalities may be reduced by 45 to 65 per cent and this vaccine is used to save flocks where a breakdown has occurred on account of insufficient immunity. It was found that deaths are eliminated one week after a blocking does in such flocks and that mortalities are limited to 2 – 15 per cent whereas this could be 30 to 45 per cent in flocks not so treated.

Since December 1971 all batches of imported vaccines are tested by Onderstepoort for efficacy. This consists of titrations before and after exposure at 37°C for one week.

So far 113 bottles of vaccine have been tested of which two batches did not attain the requisite standard.
Bacillary white diarrhoea and fowl typhoid

Four outbreaks of BWD [one in the flock of a certificate holder] and six of fowl typhoid [one in a certificate-holding flock] were reported during the year.

Data of tests performed in respect of these two diseases are summarised below:

<table>
<thead>
<tr>
<th></th>
<th>Flocks tested</th>
<th>Birds tested</th>
<th>Positive reactors found</th>
<th>Suspected reactors found</th>
<th>BWD and FT and free certificate holders</th>
<th>Birds in certified flocks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Flocks tested</td>
<td>85</td>
<td>802 182</td>
<td>10</td>
<td>14</td>
<td>86</td>
<td>1 835 857</td>
</tr>
</tbody>
</table>

In the previous report details were given of the characterisation of rough mutants of *Salmonella gallinarum* used for vaccine production. These strains give a solid immunity in the absence of smooth “O” antibodies and experiments were undertaken to investigate the nature of this immunity.

This work is continuing.

Fowl cholera

No outbreaks of this disease were reported during the year.

Psittacosis

Three outbreaks, all in birds of the parrot family, were confirmed in the Transvaal Region, and one in the Highveld. In one of the Transvaal cases, two detectives, two Bantu labourers, 2 female clerks, one game conservation officer and one State Veterinarian came into close contact with a confiscated cage of presumably smuggled parrots. Only the State Veterinarian did not contract psittacosis.

Other notifiable diseases

Scrapie

No cases of scrapie occurred during the year. Regular inspections were carried out on the steadily decreasing number of flocks to which were traced in-contact sheep from farms where cases were subsequently confirmed. Permit control of all movements from these flocks was maintained.

Equine infectious anaemia

No cases of this disease were reported during the year.
Glanders

This disease was eradicted in the Republic many years ago.

Bovine pleuropneumonia

No cases of this disease occurred in the country.

NON-NOTIFIABLE DISEASES

Deficiency and nutritional diseases

From the Highveld, Eastern Cape and Karoo, Eastern Transvaal and Transvaal Regions it is reported that as a result of the good rains, very few problems were encountered.

From Natal a general deficiency of phosphorus is reported. The Allerton Investigation Centre indicates that a method of approach that appears to have very important implications, is the study of metabolic profiles of problem farms, involving the measurement of minerals, protein and glucose. Protein and energy deficiencies have been detected by this means and imbalances corrected. From Ixopo avitaminosis A on heavily fertilised pastures, especially rye grass and kikuyu, characterised by retained placenta, as well as iodine deficiency with late pregnancy abortions and early calf mortality.

The O.F.S. Region reports aphosphorosis as widespread, but on account of the good season not of marked severity. Magnesium deficiency in sheep on green grazing was prevalent. In the Vryburg area avitaminosis B₁ caused death in ewes. Pathological examination confirmed the presence of necrotic areas in the brains of affected animals, and the administration of Thiamin remedied the condition.
In the Ermelo district of the Transvaal Region white muscles disease was confirmed in lambs in two flocks and copper deficiency was diagnosed in a herd of 200 cattle in the Piet Retief area.

The Winter Rainfall Region reports that copper deficiency remains one of the most important problems, especially in the coastal areas. Calcium and phosphorus imbalances are also fairly widespread. Dairy rations are often too high in protein content, sometimes coupled with mineral deficiencies.

In the Kruger National Park in the Eastern Transvaal Region surveys in respect of trace elements and possible phosphate deficiencies and phosphorus and other mineral imbalances are being conducted.

In connection with animal nutrition the Veterinary Research Institute reports as follows:

**Mineral imbalances in cattle, sheep and pigs**

The procedure of liver sample analysis for the diagnosis of mineral imbalances has developed into an efficient, accurate and rapid method of evaluation. Normal values developed from the means of several thousand analytical results are used as reference sources for future guidance.

Samples are being received in batches from many areas for evaluation and primarily from the Highveld, Natal, Eastern Cape and Orange Free State.

The primary mineral imbalances encountered in the order of frequency have been deficiencies of copper, zinc, manganese, magnesium and cobalt. Sporadic cases of excess copper, selenium and iron [pigs] have also been diagnosed. Recommendations for supplementation are made through lick formulations suitable for the area.

**Amino-acid – Mineral relationships in horse nutrition**

Multiple bone deviations and related conformational problems are the result of imbalances between minerals and their relationship with protein supply in the diet.

In the first of a series of investigations on the digestive tract of horses, the sampling at the duodenum and colon by means of fistulae is being undertaken to evaluate the mineral and protein digestive procedures at these sampling sites. The basic nutrients thus far evaluated are lucerne, teff and oat hay. Currently maize, oats and bran are being investigated.

At this stage of the experiment it appears that the amino-acids which are playing a prominent role, from the digestion of teff, lucerne and oat hays, are glycine, serine and valine [blood]; alanine, glycine and glutamic acid [colon] and alanine, glutamic acid and leucine [faeces].
The effect of non-protein nitrogen supplementation on the trace mineral balance of sheep

Considerable research has been conducted to determine to what extent non-protein nitrogen products can replace true protein in maintenance sheep rations. There are currently further investigations in progress to evaluate possible effects that such replacement has on the mineral balance in the breeding flock.

Breeding ewes on teff/lucerne hay rations are being fed licks containing yellow maize meal, salt, bonemeal and fishmeal or biuret.

Whereas it is premature to comment on the effects of the two treatments on mineral balance, there is a distinct difference in the acceptability of the licks in favour of that containing fishmeal. Apart from liver analyses lambing percentage and growth rates will also be evaluated.

Poisoning

Mineral poisoning

Numerous instances of poisoning were reported from all the Regions, in several instances accompanied by heavy mortality. Many cases resulted from incorrect or negligent use of such material as urea, acaricides and salt, the accidental or malicious administration of acaricides or other insecticides, and the ingestion of harmful substances such as lead and nitrates.

In one of the worst cases approximately 300 cattle were lost in natal owing to an overstrength arsenical dip. Twenty died as a result of hand-dressing with an overstrength arsenical mixture, and 52 died from organo-phosphate poisoning.
Uncontrolled copper spraying in an orchard was responsible for the death of cattle in the Eastern Transvaal district of Lydenburg, while 23 head died after organophosphate dipping in the Pietersburg district.

Two severe outbreaks of water poisoning as a result of mineralised water were reported from Upington in the O.F.S. Region, while the Winter Rainfall Region reports heavy losses in the Calvinia area from kidney and bladder stones in sheep resulting from drinking water with an excessive mineral content.

Research workers state that it was recently discovered that a skeleton abnormality in fast growing broilers can be effectively counteracted by high copper supplementation in the feed. This has become accepted practice with several of the large commercial broiler producers.

The greatest amount of the added copper is excreted in the chicks faeces and two instances of chronic copper poisoning in ruminants were encountered where these animals received relatively large amounts of chicken manure as part of their ration.

As it may take several months for sufficient copper to be accumulated to toxic levels and as the feeding of chicken manure is a fairly general practice further outbreaks may be anticipated.

The danger of dieldrin treated seed was emphasised during the past year by the increased number of outbreaks of poisoning in cattle and birds. In the former cases leftover mealie seed was involved and in the latter instance a wholesale concern released treated manna to retailers with the result that numerous outbreaks of poisoning in aviaries were encountered.

Haloxon is an organo-phosphate anthelmintic with an exceptionally low mammalian toxicity. Research has indicated that at approximately twenty times the therapeutic dose it does produce a chronic neurotoxic syndrome typical of certain organophosphates which is unrelated to the usual symptoms due to cholinesterase inhibition.

Carbon disulphide \([\text{CS}_2]\) is used for the treatment of bots in horses and over the years the simultaneous dosing of these two compounds in horses became a standard practice with many veterinarians.

During 1971 a severe mortality in horses occurred at two establishments on the Rand in which a total of 44 horses died and 60 were destroyed. The syndrome consisted of paresis followed by paralysis and sometimes paralysis of the vocal cords [roaring] and death from asphyxia. During 1970 29 horses on 5 establishments in South West Africa also exhibited symptoms with the combined use of Haloxon and \(\text{CS}_2\).
Experiments revealed that at as much as 8 times the therapeutic dose, Haloxon alone had no deleterious effect on the horse and that double the normal dose CS₂ did not produce these signs. However when CS₂ at a normal dose, was combined with Haloxon at just above the therapeutic dose of 75 mg/kg, it resulted in dramatic enhancement of the chronic neurotoxic effect of this organo-phosphate. The lesions found were scattered individual neuronal degeneration and necrosis in especially the medulla oblongata and spinal cord.

*Plant poisoning*

As a result of sufficient rains grazing was plentiful during the greater part of the year and plant poisoning did not assume the same significance as in drier years.

Regional reports indicate that the following were the major cause of stock deaths: tulp *Homeria and Moraea* spp. in the Highveld, Natal, Eastern Cape, Eastern Transvaal, O.F.S and Transvaal Regions; *Senecio* spp. in the Natal, Eastern Cape, O.F.S. and Transvaal regions; vermeerbos *Geigeria* spp. in the Highveld, O.F.S. and Transvaal; gousiekte bush *Pachystigma pygmaeum* and *Pavetta* spp. in the Eastern Transvaal, OFS. and Transvaal; slangkop *Urginea* and *Ornithoglossum* spp. in the Highveld and O.F.S.; *Crotalaria* spp. in the Eastern Cape and O.F.S.; *Lantana camara* in the Eastern Transvaal and Transvaal; *Tribulus* spp. in the Highveld and O.F.S.; inkberry *Cestrum laevisatum* and *Matricara nigellaefolia* in Natal, and melktou *Sarcolstemma viminalis* in the O.F.S.

In the only case of stinkweed *Datura* spp. poisoning reported, two thoroughbred horses valued at R15 000 died in the Piet Retief district of the Transvaal.

*Toxins*

Only isolated cases of *Diplodia zeae* poisoning and aflatoxicosis were recorded, and one instance of botulism-like symptoms in cattle fed on mouldy silage. One week after withdrawal of the silage, 12 of the 15 affected cattle recovered.

Mycotoxicological research at the Veterinary Institute is carried out in conjunction with the Plant Protection Research Institute.

Extracts of *Phomopsis leptostromiformis* cultures causing lupinosis in the Cape, and toxins for young guinea pigs at 2.5 mg/kg, were obtained by various chemical procedures. Purification beyond this level has thus far failed owing to technical difficulties arising primarily from the high polarity and/or lability of the substance.

During studies on aetiology of geeldikkop the sporidesmin content of *Pithomyces chartarum* cultures was increased 100 fold by near ultra violet light irradiation. In this way sufficient sporidesmin was obtained to reproduce facial eczema experimentally for the first time in South Africa with a local isolate.
An acute haemorrhagic syndrome with hepatosis and icterus was produced in equines by dosing with pure maize cultures of *Fusarium moniliforme* [the cause of encephalomalacia in horses]. The condition somewhat resembled lupinosis and it is the first time ever that the syndrome had been produced in South Africa.

Another mycotoxicosis was experimentally reproduced for the first time in South Africa by feeding a local isolate of a *Myrothecium* sp. to a sheep. The principal lesion produced was a severe haemorrhagic abomasitis.

**Bacterial diseases**

*Mastitis*

Mastitis remained the most important factor in the economics of dairy farming.

With the manpower available no concerted anti-mastitis action was possible. Milk examinations, which included anti-biogram tests where necessary, were conducted in all Regions on as extensive a scale as possible. This enabled the best advice on the problem to be given in every instance.

“Blue udder” in sheep occurred fairly extensively in the Winter Rainfall Region, while in the Transvaal many cases of this condition, and mastitis in sows, were encountered.

During the course of investigations at Onderstepoort, 16 250 quarter samples of milk from various dairy herds were examined. Of these 25 per cent were positive for the presence of mastitis-causing bacteria. An initial evaluation of the data collected from these investigations facilitated the establishment of essential background information as pointed out in the previous report.

It has also become apparent that improvements achieved by therapeutic and hygienic measures are of limited value in dairy cows possessing a genetic predisposition to mastitis. The importance of morphological, inheritable predisposition in the pathogenesis and epizootology of infectious mastitis is acknowledged. However, no data are available on functional hereditary predisposition.

From data obtained it appears that hereditary functional features of the udder could constitute a predisposition of major importance in the aetiology of infectious forms of bovine mastitis. Cows secreting the AB-variant of beta-lactoglobulin showed a significantly lower incidence of mastitis than cows with either the A or B-variant of beta-lactoglobulin. A similar tendency is present in cows with the AB-variant of Kappa-casein; however, the result obtained is not statistically significant probably owing to the small number of cows examined.
These initial findings are encouraging and a follow-up of this by examination of more material is important since it is anticipated that the most “mastitis resistant” animals will be found amongst the B-homozygotes and the most “mastitis susceptible” animals amongst the A-homozygotes. It is also of importance to establish how the secretion of certain gene-types of beta-lactoglobulin and of alpha-, beta-, and kappa-caseins is linked with high or low producing animals since high producers are more prone to udder-infections than low producers.

Furthermore it is the intention to determine whether any correlation exists between gene-types of milk-proteins and gene-types of blood-proteins, in which case a typing-procedure might be evolved which would facilitate the early discovery of high or low producers and “mastitis resistant” or “mastitis susceptible” animals. It is also the intention to determine whether there is a correlation between a certain gene-type of milk-proteins and the success of intramammary mastitis therapy.

In the examination of cream, milk and sediment smears for the cytological and bacteriological diagnosis of mastitis, statistically significant correlations exist between most of the diagnostic methods used. All the methods tested are only of relative reliability in cows during early lactation. In later stages of lactation methods tested – including electronic cell-counting – are considered unreliable and inadequate for diagnostic purposes. The above is also applicable to the original MORRIS-HOBBS MASTITIS TEST since the latter was based on a polyvalent antiserum. However, results established with a modified MORRIS-HOBBS TEST employing specific monovalet antiserum are very promising.

This test has the potential of becoming the first mastitis test able to provide a reliable diagnosis of epithelial damage occurring in the udder due to infection or physical or chemical trauma. The development of the original MORRIS-HOBBS TEST into the more sensitive modified test has been achieved by close co-operation between the Mastitis Research Unit of the Veterinary Research Institute, Onderstepoort, and the Virus Research Unit of the Medical School, University of Cape Town.

Enterotoxaemia

Pulpy kidney disease presented no problems in flocks where the recommended vaccination programmes were adhered to and did not occur extensively anywhere.

During the year Onderstepoort issued 30 923 350 doses of vaccine, 1 050 700 less than during 1970/71.

At the Research Institute, extensive investigations into the purification of prototoxin of this organism have been carried out and methods of assaying anti-toxin and toxin have been developed.

It has been found that of the body tissues only brain and to a lesser extent kidneys, absorb appreciable amounts of toxin. This finding indicates a specific binding site for toxin in brain and possible kidney tissue. This theory is further supported by the finding that large doses of toxoid given a few hours before toxin protects mice against 16 MLDs of toxin.
Blackquarter

Outbreaks of blackquarter were recorded in all parts of the country, in sheep, especially after shearing, as well as in cattle.

In view of the efficacy of the vaccine available, it is most unfortunate that such large numbers of animals are allowed to die of this disease every year. This applies to both Bantu and White farmers.

Onderstepoort issued 4 645 638 doses of vaccine during 1971/72, 180 676 less than the previous year.

“Lamsiekte”

The vaccine against botulism is very effective so that outbreaks of this disease are usually sporadic only and severe losses are the exception.

During the year over 200 cattle valued at R30 000 died in a feedlot in an outbreak in Natal as a result of the accidental feeding of spoiled carcase meal intended for use as fertiliser. In one outbreak in the Winter Rainfall Region a farmer lost all his cattle: these had been held with no supplementary feeding in a bare camp, where sheep carcases were thrown to obviate the labour of burying or burning them.

Dead muscovy ducks in a drinking trough caused the death due to botulism of 11 dairy cows in the Transvaal Region. An owner who did not believe in the destruction of carcases – at the time of investigation one sheep carcase was found in the feed trough – suffered severe losses in sheep and horses in an outbreak in the O.F.S.

The feeding of garbage from a mine compound is suspected of being responsible for a severe outbreak in the Highveld Region.

Corynebacteriasis

All Regional Reports refer to the prevalence of this disease in both cattle and sheep. There are indications that the incidence is rising.

The disappointing results so far obtained with preventative vaccination are underlined by reports received from the Natal, Eastern Transvaal and O.F.S. Regions.

Pasteurellosis

Only sporadic outbreaks, mainly of a minor nature, occurred over the greater part of the Republic. From the O.F.S. Region relatively high mortalities in lambs were reported on many farms. In the Winter Rainfall Region the spread of the disease in the sheep areas is causing alarm. This is especially the case where sheep are fed during drought periods or on grain farms. Serious problems are also being experienced where the large-scale rearing of beef calves is undertaken.
Tetanus

Only a few cases were recorded and the disease is of very little importance in South Africa.

Colibacillosis

*Echerichia coli* infection is reported to be the greatest single factor in perinatal calf and lamb mortality and is also responsible for heavy losses in piglets and chicks. Outbreaks are almost invariably triggered off by sub-standard conditions of hygiene.

Some doubt appears to exist about the efficacy of the available vaccine.

Leptospirosis

At the Stellenbosch Investigational Centre 406 of the 5488 specimens examined for leptospirosis were found positive and at Onderstepoort 39 of the 2354 examined. Cattle, pigs, horses and dogs proved positive to a wide range of serotypes.

In one herd of cattle and one of swine in Natal, leptospirosis was originally incriminated as the cause of an abortion storm and breeding troubles, but subsequently grave doubts have arisen as to whether leptospiral infection played any role in the aetiology.

No definite proof has been presented that leptospiral infection is economic significance.

Vibrionic dysentry of pigs

In the majority of Veterinary Regions no outbreaks were recorded and in the rest only a small number of isolated cases.

*Pseudomonas* infection

Only the O.F.S. Region reports the confirmation of this organism as being the cause of a limited number of cases of mastitis in cows and “blue udder” in sheep.

*Lamb dysentery [*"Bloedpens"]*

Only one case of this disease was recorded during the year, in the Highveld Region.

*Actinobacillosis and actinomycosis*

A few isolated cases of these infections were recorded, but the condition is of little significance.
Staphylococcus aureus

The major cause of bovine mastitis in all parts of the Republic was again found to be \emph{S. aureus}. From the O.F.S. and Winter Rainfall Regions it is also reported to be the chief cause of mastitis in ovines.

Protozoal Diseases

General

As a result of the good rains and other favourable climatic conditions, tick life flourished in most parts of the country and tick-borne diseases assumed more than average importance.

Babesiosis

\emph{Redwater in cattle} was again most prevalent the coastal areas of the Eastern Cape and in the Natal and Transvaal Regions where it is of great economic importance. In the Eastern Transvaal, Highveld and O.F.S. Regions a limited number of outbreaks occurred, but the incidence is reported to be on the increase in the latter two areas. Frequent outbreaks were encountered in the eastern coastal strip of the Winter Rainfall Region.

At the Research Institute the infectivity of the blood of splenectomized cattle infected with either \emph{Babesia bigemina} or \emph{B. bovis} was studied with a view to elucidating the unsatisfactory results obtained with Onderstepoort redwater vaccine in the field. It was found that as soon as 2 and 4 months after infection with \emph{B. bovis} and \emph{B. bigemina} respectively 2.5 ml blood, constituting a vaccine dose, was no longer uniformly infective despite that the respective donors were still harbouring low level infections. This investigation clearly indicated that the use of blood from active cases is essential for vaccine production and this is now being implemented.

Various dipping procedures on a farm in the Ixopo district gave an indication that short-interval dipping was detrimental to the immunity against redwater. Animals not dipped for twelve months were far more resistant than those dipped regularly.

A survey of blue ticks in the districts of Port Shepstone, Umzinto and Ixopo showed that \emph{Boophilus microplus} was the dominant \emph{Boophilus} species. Out of a total of 2380 blue ticks received for identification 91.5 per cent were \emph{B. microplus} and 8.5 per cent \emph{B. decoloratus}.

Tick transmission of \emph{B. bigemina} was successful using \emph{Boophilus microplus} originally obtained from Port Shepstone.

\emph{Canine biliary fever} was prevalent in most parts of the Republic, but \emph{equine biliary fever} occurred only in isolated cases.
Anaplasmosis

Gallsickness cases occurred widespread in the Republic, but did not constitute a serious problem anywhere.

Issues of the improved vaccine referred to in the previous report amounted to 368 642 and 46 081 doses from Onderstepoort and Allerton respectively, a decrease of 80 261 doses compared to the total issue for 1970/71.

An experiment on the pathogenicity, longevity and immunogenicity of anaplasmosis vaccine, obtained from splenectomized donors and packed on ice, produced some rather unexpected results. It was found that *Anaplasma centrale* was considerably more pathogenic for adult susceptible cattle than has hitherto been thought to be the case. Fairly severe to severe anaemia was observed in all 13 vaccinated animals. One died from typical anaplasmosis and a second animal would have succumbed if it had not been treated specifically. The height of the reaction was reached approximately 6 weeks after inoculation. It was usually accompanied by mild fever and maximum anaemia was recorded a few days later. The longevity of the vaccine was well in excess of the expiry date recorded on the label. When the animals were challenged 3 months after vaccination with *A. marginale* one [8 per cent] reacted as severely as the controls whereas eleven [92 per cent] were protected against the development of clinical signs, but not against infection.

In view of the excellent longevity of the above-mentioned vaccine the possibility of reducing the dose used has arisen and is being investigated.

Besnoitiosis

No spread of elephant skin disease was reported within or from the known enzootic areas.

Laboratory and field trials on the efficacy of a living vaccine prepared from a strain of *Besnoitia besnoiti* isolated from blue wildebeest were continued.

Cattle vaccinated at the laboratory more than 2 ½ year previously were challenged with a large intravenous inoculum of a bovine strain of *b. besnoiti*. They developed mild febrile reactions and small numbers of cysts were detected at slaughter. The controls, on the other hand, showed fairly severe clinical reactions characterized by pronounced pyrexia, inappetence, mild anasarca, microscopically detectable parasitaemia and relatively large numbers of cysts.

Evidence of a durable immunity was also obtained in field trials. Of the approximately 2 000 head of cattle vaccinated at least 2 years previously, 1 434 were still available for a study in the winter of 1971. They were examined for evidence of infection by scrutiny of the scleral conjunctiva for cysts in the usual way. Analysis of the results revealed that 0.6 per cent [9] of the infection over the 2 years. In contrast, the infection rate in the controls was 27.4 per cent [21], 2.4 per cent [4] of
which showed typical clinical signs, the balance being subclinically infected. From these figures it can be calculated that 100 per cent of the vaccinated animals were protected against the clinical form and 97.9 per cent against the subclinical form of besnoitiosis over a period of two years after a single inoculation.

*Coccidiosis*

Sporadic outbreaks of coccidiosis in cattle, calves, sheep, lambs and poultry were confirmed during the year in all parts of the country. Outbreaks in cattle and sheep occurred mainly on artificial pastures or in feedlots.

*Virus diseases*

*Bluetongue*

Relatively few outbreaks of bluetongue were recorded during the year, except in the O.F.S. Region, where many outbreaks occurred in both vaccinated and unvaccinated flocks, and in the Winter Rainfall Region where the disease was encountered mainly in the Calvinia area. Outbreaks were in general not accompanied by severe losses.

Research workers at the Institute report as follows:

*Bluetongue*

In a project designed to determine additional facets of the role of cattle in the epizootiology of bluetongue it was found that colostrum deprived calves, when infected with bluetongue virus, showed no deviation from the pattern of viraemia previously encountered in experiments conducted in adult cattle in this country. The experimental animals remained clinically unaffected and viraemia was of only short duration. The significance of the fact that one of the calves failed to show any detectable immunological response in spite of infection, remains to be determined.

Trials were commenced with the object of developing an inactivated vaccine against bluetongue. Vaccines prepared by the addition of formalin and incorporating an oily adjuvant have given a good immune response in adults young lambs.

*Multiplication of the bluetongue virus*

Based on the fact that the bluetongue virus, as well as the virus causing horsesickness, possesses a double-stranded RNA genome, it has been suspected for some time that these viruses should have an extraordinary multiplication mechanism. Because this form of RNA does not generally occur in normal cells, these cells normally do not possess an enzyme to manufacture or utilize double-stranded RNA. It was, therefore, clear that the diplornaviruses, as the group is
called, should either possess such an enzyme or should be able to stimulate the infected cell to the synthesis of this enzyme. The latter possibility has been excluded experimentally and the logical conclusion was that the bluetongue virus, in contradistinction to most other viruses, possesses its own RNA-dependant RNA-polymerase. All previous attempts to confirm this suspicion have, however, failed. No enzyme activity could be found in the virus in vitro.

During the past year an intensive study was made of the polypeptide components of the protein cover of the bluetongue virus. Four chief components and three subcomponents were found. It was further discovered that two of the chief components form a diffuse layer on the virus capsid or cover. These two polypeptides can be removed selectively by exposure to high salt concentrations. When the virus loses this outer layer it also loses its infectivity, but at the same time the enzyme activity, which had been sought for so long, is activated. With these activated, treated virus particle it is now possible to synthesise messenger RNA. The result is that one of the most important steps in the multiplication cycle of the virus can now be studied under perfectly controlled conditions.

Studies on the pathogenesis of bluetongue

B.H.K. 21/C13 tissue culture cells are used for the detection and titration of BT virus in tissues of experimentally infected sheep. The sensitivity of these tissue culture cells and of sheep to a certain type of BT virus was compared. It was found that tissue culture cells and sheep showed equal sensitivity in the quantitative estimation of virus content.

From the preliminary results it appears that when sheep are inoculated subcutaneously with a certain amount of BT type 10 virus, the first sites of virus replication are the regional lymph nodes, the spleen and the lungs. Virus was detected in the above organs on the 6th day post inoculation and thereafter. It appears that viraemia becomes detectable only after virus replication has taken place at the above-mentioned sites.

The direct and indirect fluorescent antibody technique was applied using virus cultivated in tissue culture.

Horsesickness

In 4 of the 7 Veterinary Regions only a limited number of outbreaks were recorded, but the Eastern Transvaal, O.F.S. and Transvaal Regions experienced serious outbreaks. Severe losses occurred throughout the Eastern Transvaal and in the Johannesburg – Pretoria are, while in the Kimberley – Vryburg are many cases were seen in vaccinated horses and even 6-weeks-old foals.

In studies on the pathogenesis of African horsesickness [A.H.S.], infectivity titrations performed on specimens collected from horses that died following natural and
artificial infection with A.H.S. virus revealed high virus titres in the lungs and in organs containing lymphoid tissue such as spleen, lymph nodes and pharyngeal mucosa. Only traces of virus were found in cardiac muscle, brain, spinal cord and bone marrow.
The results of other experiments indicated that natural horsesickness virus is composed of a mixture of virulent and avirulent virus particles. These could be separated by plaque selection in tissue culture as well as by the serial passage of either lung or spleen. The significance of these findings is that avirulent colonies of virus could be selected at relatively low passage levels for the purpose of vaccine production. Such vaccines promise to be safe and highly immunogenic.

*Heartwater*

In all the enzootic heartwater areas the disease took its usual toll, especially where owners relaxed their vigilance or did not take adequate precautionary measures.

In connection with research on this disease, Onderstepoort reports as follows:

*Heartwater in mice*

Up to the present a strain of *Cowdria ruminantium* from a goat and isolated in mice, has been passaged 74 times in mice. The pathogenicity for mice has remained unchanged and the organism still kills 100 per cent of mice. When infected material from mice is inoculated into susceptible sheep and cattle, the sheep invariably become ill, with high temperature reactions and about 10 per cent of deaths occur. It appears that the mouse adapted strain becomes more virulent for sheep as it is passaged through sheep.

In cattle the mouse adapted strain causes a slight temperature reaction only in some younger animals and a promising immunity develops against a virulent strain.

In view of the above findings investigations are now continuing on the possibility of using this mouse adapted strain for the immunisation of sheep and cattle.

In the meantime investigations with the mouse adapted strain are continuing, in respect of the viability at various temperatures, the mechanism of immunity and its pathogenesis in mice. These investigations might ultimately contribute towards the solution of various problems with this disease in stock.

*Heartwater in other small laboratory animals*

The mouse adapted strain of *c. ruminantium* was also injected intraperitoneally into rats, hamsters and guinea pigs. In hamsters three out of six died with typical lesions of heartwater. Rats and guinea pigs showed no reaction whatsoever, but subinoculation of liver and spleen material, taken from them 30 days after infection, into mice resulted in typical symptoms and death in the latter.

*C. ruminantium and tissue culture*

Attempts have been made to grow this organism on a culture of line cells from the mosquito, *Aedes albopictus*, and on a culture of mouse peritoneal mactophages. It
was found that the parasite did grow in both cultures, as its presence was demonstrated microscopically in culture smears, and the intravenous administration of cultures into susceptible sheep gave a temperature reaction and partial immunity in most cases. The growth was, however, poor and the parasite attenuated or altered to such an extent that the disease could not be produced by subinoculation, while the immune response was poor.

**Ephemeral fever**

With the exception of the Eastern Cape and Winter Rainfall Regions, three day stiffness appeared widespread. In some instances the percentage of cattle affected in a herd was high, but no serious losses were sustained as a result of mortalities.

Preliminary investigations reveal that ephemeral fever [E.F.] in dairy cows is of far greater economic importance than hitherto suspected, as the following findings indicate. There is a severe loss of milk yield, which to some extent is dependent upon the stage of lactation. Cellular reaction in the udder causes an increase in leucocyte content of the milk, which may lead to discarding of the milk due to hygiene considerations. There are indications that the disease predisposes to udder infections. Pregnant cows tend to abort or give birth to weak or dead calves.

The investigations aimed at the development of an effective vaccine against E.F. have been completed. A low passage level of E.F. virus inoculated in conjunction with incomplete Freund’s adjuvant induced the highest level of immunity and most durable immunity in cattle. Large-scale production of this vaccine has commenced and it should soon be available for distribution to farmers.

**Rift Valley fever and Wesselsbron disease**

No cases of these two diseases were reported. It is of interest to note that in a survey by the South African Institute for Medical Research, 14 per cent of 272 blood specimens from bovines collected in the Port Shepstone coastal area proved positive for Rift Valley fever and 21 per cent for Wesselsbron disease, although no cases of these disease have ever been observed on the Natal South Coast.

Investigations are continuing at the Institute into the improvement of the RVF vaccine in cattle. Various attenuated strains have been evaluated and the possible addition of an adjuvant has been studied. There would appear to be a considerable difference in the immune response of cattle as against sheep to this particular attenuated strain in which species the vaccine has proved very effective in the past. The incorporation of an adjuvant did not increase the immunogenicity of this strain in cattle and investigations to find a less attenuated strain which is immunogenic yet safe are proceeding.

**“Snotsiekte”**

Two outbreaks of bovine malignant catarrh were confirmed in each of the Natal and Eastern Transvaal Regions and one in the Highveld. In all instances there had been contact between cattle and wildebeest.
“Jaagsiekte”

According to the report from Natal, fewer cases occurred in East Griqualand, where a high incidence was recorded during the previous year. This is ascribed to the mild winter. Only one other outbreak was reported, from the Bethlehem district in the Highveld Region.

During the past year a project was commenced at Onderstepoort for the purpose of finding the cause of jaagsiekte in sheep. The occurrence of the disease in certain flocks and on certain farms has long since supported the suspicion that the condition is infectious. No causal organism has as yet been isolated. Transmission of the disease by means of cell-free and bacteria filtrates has been accomplished in overseas countries. It is therefore generally accepted that a virus is probably the cause.

As no virus could as yet be isolated, it is probably that a so-called latent virus is involved, similar to that causing blood cancer in animals. These viruses can only be isolated after induction, i.e. after their multiplication has been stimulated artificially by means of irradiation, chemical treatment or helper viruses. In order to obtain this, one should in the first instance have cell cultures containing the latent virus genome. Cultures of cells from jaagsiekte lungs have therefore been made. Promising results have been obtained and cell cultures can now be reproduced, showing colonies of transformed cells. Problems are still being encountered in keeping these cells alive.

Virus pneumonia of pigs

Isolated outbreaks of this disease were reported from the Vryburg area of the O.F.S. Region, while several unconfirmed cases were seen at meat inspection at a bacon factory in Estcourt.

Equine rhinopneumonitis

No cases of this disease were recorded.

Infectious ophthalmia

Reports from the O.F.S. Region indicate that because of the mechanical irritation caused by the seeds and blades of the grass stand which is particularly high, and the abundance of such transmitters as flies and other insects, this condition was prevalent in sheep. Cases where almost entire flocks were affected, were not uncommon.

A large number of outbreaks were recorded in the Calvinia area of the Winter Rainfall Region. Treatment of the condition was found to be of no avail unless measures to repel flies were simultaneously employed.
“Vuilbek”

Outbreaks of contagious pustular dermatitis – none of a very serious nature, and causing only slight losses – were recorded in one State Veterinary area in each of the O.F.S., Transvaal and Winter Rainfall Regions.

Infertility and venereal diseases

General

A large number of herds and flocks were examined during the year for infertility and low fertility. A common finding was that in many instances not infectious conditions, but functional sterility due to insufficient nutrition, deficiencies and imbalances in rations and bad managerial practices, including lack of proper records, were responsible for breeding problems.

In one herd in Natal where the conception rate was poor and 90 per cent of the cows suffered from retained afterbirth, the condition was rapidly remedied by the addition of mono-sodium-phosphate to the ration. Poor conception was also encountered in cows on heavily fertilised [nitrogen] pastures, but the condition was rectified by the administration of Vitamin A.

Many case of calcium, phosphorus, copper and manganese deficiencies or imbalances causing reproductive problems were reported from the Winter Rainfall Region, as well as a case of protein excess in the diet as a result of lover grazing corrected by the feeding of additional carbohydrate.

Two types of infectious epididymitis [Brucella ovis and Actinobacillus seminis] are known to occur in rams. Fluorescent antibody sera were produced at Onderstepoort against the two organisms and found to be highly specific. For technical reasons the sera could not be used directly on semen smears as a rapid diagnostic technique. The sera have, however, proved useful for the rapid identification of cultures made from semen.

Experiments were carried out to find a suitable method of infecting rams with A. seminis. The most successful method was direct intratesticular injection.

Two experimental vaccines were made. An oil emulsion vaccine of heat-killed organisms caused a good antibody response. A formalin-killed alum precipitated vaccine induced as much weaker antibody response. The immunity produced by the vaccines has not yet been tested because a suitable method of challenge has not been found, in spite of various methods.

The efficacy of Rev. I vaccine in protecting rams against B. ovis infection is being re-investigated, following a report in which 5 per cent infection was found in non-vaccinated flocks and 3.6 per cent in vaccinated flocks.
At the Institute studies on the distribution of mycoplasma and fungi in the genital tract and the pathogenesis of the condition in cattle were continued. Out of 1,225 sheath washings examined *Mycoplasma* species could be isolated from 255. Classification of these isolates has not yet been completed.

Only six out of 960 sheath washings from bulls examined for fungi, were positive. They all belonged to saprophytic groups.

*Vibriosis*

By subjecting 1,424 sheath washings and 1,044 cervical and vaginal mucus specimens to immunofluorescence and isolation methods, 71 *Vibrio fetus* infected bulls and 129 infected female animals were discovered at Onderstepoort. In addition 2,137 specimens were examined at Investigation Centres.

Vibriosis is widespread in the Republic, but is fortunately being stamped out in those areas where artificial insemination is used on a big scale. The disease is of greater significance where farms are not within reach of artificial insemination services.

*Trichomoniasis*

Only isolated cases of Trichomonas infection were diagnosed and then only in some of the Regions. The disease was of very slight significance.

From 1,376 sheath washings from bulls examined at Onderstepoort for *Trichomonas fetus* 112 were positive. The majority were from the Orange Free State. It was again proved necessary for sheath washings to be inoculated onto specific culture media, in addition to direct microscopic examination. Twenty out of the 12 positives could only be declared positive after culture examination.

*IPV/IBR*

Infectious *pustular vulvovaginitis* and infectious *bovine rhinotracheitis* has over the years been diagnosed in its IPV from in many parts of the Republic. The significance of the condition has not been proven beyond doubt as clinical manifestations are very seldom seen in herds in which infection has been established.

According to research workers the attenuation of IPV virus by serial passage in tissue culture was very disappointing on account of the very poor immunogenic responses obtained in cattle.

Subsequently, a low passage level of IPV virus was inactivated with formalin and adsorbed onto aluminium hydroxide. Intramuscular inoculation of this adjuvanted vaccine into cattle stimulated the development of a solid immunity against this virus. At present the optimal dosage and the duration of immunity are being investigated.
Chlamydiosis

As indicated in the Introduction the most important occurrence during the year was the appearance of enzootic abortion, which caused widespread extensive abortions practically throughout the sheep farming areas of the country. In infected flocks the disease was also responsible for the birth of a very large percentage of weak lambs which died at an early stage from a variety of causes. In the absence of exact data losses cannot be accurately assessed, but estimates of losses as high as 90 per cent in affected flocks have been made with an average of 30 to 40 per cent.

Abortions and other losses in goats, cattle and horses were also recorded.

There appear to be grounds for suspecting that, although enzootic abortion was only diagnosed during the year, it has been present in the Republic in enzootic form for several years, and that conditions favourable for the disease led to the present explosive appearance.

The report of the Research Institute reads as follows:

Sheep – Very serious outbreaks of abortions occurred. Comprehensive investigations were carried out and Chlamydia organisms were identified in 85 per cent of the outbreaks. This finding was confirmed in most cases by positive Chlamydia serum titres and/or isolation of the organism.

Interesting lesions and syndromes are observed in lambs from flocks with abortions. These comprise pneumonia, loss of condition, affections of the brain and intestinal tract. Chlamydia are isolated from the affected animals.

Of the 101 outbreaks investigated Vibrio fetus organisms could only be isolated in two. These strains were of the OI sero-types which coincide with those occurring in cattle. In a further two outbreaks [in one of which Chlamydia was found] Brucella organisms were identified. Tests for Mycoplasma, Toxoplasma, Listeria, fungi, non specific bacterial and virus affections were negative.

Cattle – As in the case of sheep, comprehensive investigations of cattle for infectious causes of peri-natal mortalities were carried out. During the year 136 foetuses and still-born calves or calves which died shortly after birth, originating from 59 herds, were examined. In 14 of these outbreaks Brucella abortus was identified and in 5 cases Vibrio fetus sero-type OI was isolated. In 28 herds [47 per cent of outbreaks] Chlamydia was determined. Studies on the causes of abortion and the pathogenesis of Chlamydia in the adult animal, were commenced during the year and will probably be completed in the following year.

Horses and goats – From foetuses originating from three horse studs Chlamydia were isolated from two of these studs, while elementary bodies were demonstrated in placental tissue from the third one.
All the material received from two goat herds showed *Chlamydia* organisms.

**Granular vaginitis**

From Dundee in the Natal Region it is reported that granular vaginitis is widespread and is not very amenable to treatment.

**Diseases of calves**

**White scours**

As in previous years *Excherichia coli* infection caused serious losses throughout the country, especially in dairy herds where hygiene and management were not of a sufficiently high standard. Reports also indicate that on some farms strains of *E. coli* are involved against which the available vaccine does not offer any protection.

**Paratyphoid**

The prevalence of calf paratyphoid is declining, mainly as a result of the increased use being made of the highly efficacious vaccine, but also because of the improvement in calf hygiene. Sporadic outbreaks were, however, reported from all parts of the country.

**Coccidiosis**

*Coccidiosis* in calves was of little economic importance, as only isolated small-scale outbreaks, which rapidly responded to treatment, were recorded.

**Calf diphtheria**

Only one outbreak of this disease was recorded, namely from the Bethlehem area of the Highveld Region.

**Sweating sickness**

Sporadic cases were reported from the Mafikeng area of the Highveld Region, the Mossel Bay area of the Winter Rainfall Region and all the enzootic areas of the Transvaal Region except Rustenburg, where the disease was widespread. The Vryheid and Nongoma areas of Natal experienced extensive outbreaks, involving also adult cattle. In the Eastern Transvaal the disease was prevalent. Some cases of sweating sickness were also seen along the Molopo River in the Vryburg area of the O.F.S. Region.

Onderstepoort states that no further strains of *Hyalomma truncatum* capable of producing sweating sickness have been isolated since 1953 when it was discovered that the progeny of a single female tick could cause this mysterious disease. For unknown reasons the strain concerned lost its ability to produce the disease after 18 years of laboratory maintenance, during which time it went through 23 filial generations.
During the past year it has been possible to isolate a further 5 strains of *H. truncatum* which cause sweating sickness, from ticks collected in Zululand and the Uitenhage district.

Sweating sickness-producing strains were selected by feeding some of the adult progeny of single females on individual susceptible sheep and studying the ensuing reactions for typical symptoms.

From these observations it is clear that sweating sickness-producing *H. truncatum* ticks are not as rare and difficult to obtain as has been thought to be the case.

*Virus pneumonia of calves*

This condition was recorded in the Pietermaritzburg area of Natal, where 160 calves, housed in an intensive system in a calf rearing project, were lost.

**Diseases of poultry**

*Infectious bronchitis*

This condition is reported to be of great economic significance in the Natal, Transvaal and Winter Rainfall Regions, where it occurs widely. In Natal it is regarded as the main cause of a drop in egg production, and in the other two Regions as of major importance in broiler production.

The egg-attenuated I.B. Massachusetts vaccine is now being marketed and field trials confirm the preliminary experimental results, namely that good immunity is conferred if only administered once at six weeks old, in areas where the natural infection at a later age gives a booster immunity.

An experiment is presently being conducted to compare the immunity in 40 000 broiler chicks conferred by eye droplet vaccination with that given in the drinking water. Results so far have shown that no untoward reactions occur. Experiments on broiler chicks, and modifications of vaccination programmes resulting from immunity studies, are continuing.

*Infectious Coryza*

Thirty isolates frozen in egg yolk were purified and freeze-dried at the Research Institute. These isolates originate from the following areas and species:

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One isolate each was obtained from pigs, human beings, canaries and turkeys respectively.

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79/...
Preparation of hyperimmune serum from the 2 overseas isolates has commenced. A bacterin has been prepared on a small scale from one of the local isolates. The vaccine was prepared in chicken broth. Aluminium hydroxide was used as a adjuvant.

Forty-five roosters were inoculated with the vaccine and groups of these were challenged at 3 weeks, 2 months and 4 months, respectively. Apparently a good immunity was conferred, when compared to the controls.

Large-scale vaccine trials are now being carried out on two farms. The bacterin is manufactured from organisms isolated on these two farms. Challenge results are not yet available.

Yields of organisms for vaccine production are being investigated on various media as well as the antigenicity of the organisms. Ten fowls were inoculated with chicken broth vaccine and ten with tryptose broth vaccine with aluminium hydroxide as adjuvant. The protection conferred after three weeks showed no difference between the two vaccines.

Mycoplasmosis

In order to study and evaluate the role played by *Mycoplasma* organisms in poultry pathology, it is essential that all isolates made are properly and accurately identified and typed. As research workers differ from one another regarding the grouping and classification of these types, it has been decided to commence this project from basic principles.

For this purpose type cultures have been requested from various research workers in the U.S.A. working on this subject. In addition cultures are being utilised which were available locally. From these cultures, single colonies have been isolated repeatedly by means of terminal dilution techniques to ensure the purity of the cultures and to study their colonial morphology.

From this it appears that, although in certain instances clearcut morphological differences exist, the colonial morphology in most cases gives no indication of the purity of the culture of the type to which the culture belongs. The presumably pure cultures were studied further to confirm their purity and to determine their basic characteristics.

The sterol [cholesterol] requirements, as essential growth factor, were established in order to determine which cultures belonged to the family of Mycoplasmataceae and of Acholeplasmataceae; of 39 pure cultures examined so far, 38 belong to the genus *Mycoplasma* and one to the genus *Acholeplasma*.

Considerable problem are being encountered in grouping the S type *[M. synoviae]* with existing techniques, but further attempts with modified techniques are continuing.
Furthermore, the resistance of the organisms to unfavourable circumstances [temperature and chemicals] is being investigated, to serve as an additional basis for the purification of cultures and the classification. Promising results have been obtained and the work is progressing.

Cultural characteristics and serological techniques are also being studied. From 14 cultures tentatively regarded as pure, hyperimmune sera were produced in rabbits. With these sera 31 cultures were typed by means of the growth inhibition test and 17 with the metabolism inhibition test. From this it appears that the growth inhibition test yield very good results without cross-reaction between the different types. The metabolism inhibition test compares favourable with this, but in certain cases unexpected serological similarities do appear, the significance of which is still being investigated.

This work is showing good progress and should be largely completed during the coming year, thereby making type cultures locally available in order to characterise most of the poultry Mycoplasma types.

Fowl pox

The majority of the Regions reported only isolated outbreaks. Increasing use of the vaccine has reduced the status of this disease to one of no real significance. The 6 680 800 doses of vaccine issued during the year by Onderstepoort represent an increase of 981 800 over the issue for 1970/71.

Internal parasites

As a result of the high rainfall and other conditions favourable to internal parasites, economic losses due to this scourge were very high this year. This was especially the case in the Natal and Transvaal Regions, but the Highveld, O.F.S. and Winter Rainfall Regions were only slightly less affected.

In all the Regions tapeworms in young stock and roundworms played the biggest role; in the Highveld, Natal, Transvaal and Winter Rainfall Regions liver fluke was of great significance, while conical fluke created problems in the Highveld, O.F.S., Transvaal and Winter Rainfall areas; measles in cattle and pig led to severe losses in Natal, the O.F.S. and Transvaal; nasal worm was troublesome in Natal and Transvaal; in the O.F.S. the condemnation of livers because of liver tapeworm infestation caused serious economic losses.

In the course of surveys, and in diagnostic services to farmers, State Veterinarians throughout the country conducted post mortems and examined 37 583 faeces samples as an aid solving problems of internal parasitism.
A survey was carried out to determine the incidence of nematodes in sheep at various times of the year on the Bethlehem Experimental Farm, in the Eastern Free State. Ewes and lambs were placed on natural pastures and 5 lambs slaughtered every four weeks. It was found that the wireworm *Haemonchus contortus* was prevalent during the wet season. Bankrupt worm *Trichostrongylus* spp. occurred throughout the year. Nodular worm, *Oesophagostomum columbianum*, increase from February onwards, overwinters in lambs and increases once more in spring. Whipworm *Trichuris ovis* and longnecked bankrupt worm *Nematodirus spathiger* occur sporadically. This information will undoubtedly lead to more effective control of helminthiasis in sheep in this Region.

At the Research Institute the method of testing anthelmintic efficacy in ruminants has been improved so that the results may be assessed by the non-parametric statistical method. In the case of equines, however, there is little or no information regarding the reliability of the various methods of evaluating anthelmintic efficacy. Moreover, such an evaluation is hampered by the difficulty of recovering relatively small nematodes from the vast mass of ingesta present in the caecum and colon of these animals.

The technique used to recover gastro-intestinal nematodes from ruminants in a modified Baermann apparatus in a waterbath was adapted to recover nematodes from a mule.

In a critical anthelmintic test the animals were treated and their faeces collected to determine the number of worms subsequently excreted. Finally the animals were slaughtered and the efficacy of the drug was based on the proportion of worms excreted to those remaining in the animal. In five donkeys this test gave excellent results for adult worms from the caecum and colon, but was unreliable with those in the stomach and small intestine as well as the larval stages in the caecum and colon because they were digested before expulsion.

Previous work at Onderstepoort has indicated that gut-tie in Merino and Karakul sheep may be due to nodular worm infestation. Peracute obstruction was caused artificially in Merino sheep to study the physiological effect of a total obstruction of the small intestine. Preliminary observations show that the clinical signs accompanying such an obstruction are similar to those of gut-tie.

Reports have been received from various parts of the Transvaal that horses, particularly thoroughbreds, are often heavily parasitised with *Gastrodiscus aegyptiacus*. As its life cycle is not fully known effective control measures cannot be institutes.

Subsequent studies by research workers showed that both *Bultinus tropicus* and *Bulinus forskalli* may act as its vector. The former species is more common and widespread and is probably the main vector. It was found that the incubation period before the egg becomes infective to snails is dependent on the temperature. Snails begin shedding cercariae [i.e. the stage which is infective to equines] 55 days after infestation and eggs are found in the faeces of infected horses 95 days after infestation.
Existing remedies for the treatment of bilharzia in cattle are too expensive, generally difficult to use and dangerous to heavily infested animals.

During an outbreak in Northern Transvaal, infested cattle were treated during the period of 4 to 6 weeks with a relatively inexpensive organic phosphate worm remedy. The results are promising, as deaths ceased immediately after commencement of treatment and the worm burden decreased considerably as compared to untreated cattle. Further experiments under strictly controlled circumstances are however essential.

During studies on the longevity of the free-living infective larvae [cercariae] of the bilharzia parasite *Schistosoma mattheei*, it was found difficult to distinguish between live and dead larvae. A staining method was developed to make the identification of dead and live cercariae possible. This method is also useful in the evaluation of the quality of cercariae used in experiments.

Necropsy and histopathology has been carried out on 32 experimentally exposed cattle and on 14 naturally affected bovines.

Correlations have been made between duration of infestation, number of parasites recovered and pathological findings, and the pathology of chronic bovine bilharziasis has been described.

Major findings or conclusions thus far available are that the pathological changes present are thought to be dependent on the severity and duration of infestation rather than the number of exposures to cercariae.

Lesions involve all parts of the gastro-intestinal tract distal to the oesophagus, parts of the urinary system [kidneys, ureters and bladder], liver [consistently producing peri-portal fibrosis in chronic cases], most lymph nodes of the animal and the lungs in a large percentage of cases.

In sheep, measles, caused by the bladderworm of the dog tapeworm, *Taenia ovis*, have the same distribution as measles in beef and pork and it is hoped that this parasite may be used as a model for research on beef and pork measles. Previous work at the Institute has, however, shown that measles in sheep may degenerate when they are only 28 days old, thus indicating that they probably not the normal host of this parasite.

When sheep are infested with these eggs many cysticerci develop but very few [7.2 per cent] are viable after 3 months. In contrast to this, few cysticerci develop in goats but the majority [87.8 per cent] are still viable after 3 months. It is therefore probable that goats of some ruminant other than domestic sheep, are the natural intermediate host of this tapeworm.

*Trichinella spiralis* is a nematode parasite of pigs, rodents and carnivores which is of great economic importance as it may also be transmitted to man via infested meat. In Africa, however, this parasite has been found only in wild animals, and in the Republic it appears to be limited to the Kruger National Park.
Experimental infestations showed that the multimammate rat, *Praomys [Mastomys] natalensis*, is more susceptible to the Kruger National Park strain of *T. spiralis* that are either white rats or white mice. In these rats a greater number of adults develop and they produce more larvae for a longer period than in other hosts. It was also found that male white mice are more susceptible than female white mice, but this has not yet been investigated in multimammate and white rats.

A total of 69 534 specimens from pig carcasses at abattoirs and 1 040 from wild animals in the Kruger National Park were examined for *T. spiralis* during the year and all found negative.

**External parasites**

As a result of the favourable climatic conditions ticks created serious problems all over the country. Lice in sheep were very troublesome in the Natal, Eastern Transvaal, O.F.S. and Transvaal Regions, with heavy infestations in Natal and the O.F.S. Cattle were also infected. Australian itch was a problem in the Natal and Winter Rainfall Regions. In parts of the northern Transvaal screw worm in cattle caused losses.

In the North-Western Cape areas of the O.F.S. Region sand tampans caused the usual losses, while along the Orange River biting midges occurred in great numbers. Blowflies caused extensive damage in the Winter Rainfall Region. In the Kruger National Park mange was found to be a serious threat to lion and cheetah.

The investigation on resistance of South African ticks, particularly the genus *Boophilus*, the various dips was continued. *B. microplus*, the prevalent blue tick from Pondoland, received particular attention. This species, collected from nine dipping tank areas in Bantu reserves, was first multiplied at the institute and thereafter fully tested in the laboratory. Two strains of *B. decoloratus* received from the Cape East were similarly tested.

The laboratory tests reveal that *B. microplus* from Pondoland is resistant to arsenic, fairly sensitive to the chlorinated hydrocarbons like BHC and DDT and very sensitive to the organic phosphates. On the other hand the Cape East strains of *B. decoloratus* are not only more resistant to arsenic and highly resistant to the chlorinated hydrocarbons, but also highly resistant to certain organic phosphates.

These laboratory findings reflect the present situation in the above-mentioned areas regarding the effective application of certain dipping materials.

In those areas where *Boophilus* species are resistant to arsenic, but sensitive to the chlorinated hydrocarbons, these products are added to arsenical dips and generally used in cattle dipping tanks. Arsenic plus DDT is therefore the dip generally used especially in Pondoland and other Bantu areas. The withdrawal of BHC and DDT has made it urgently necessary to recommend a substitute. The obvious group of dipping materials is the organic phosphate group, which has not previously been used in the area and which, as indicated by laboratory test, should be very effective.
The members of the organic phosphate group especially suitable as substitutes are those which can be used alone in the dipping tank i.e. without the addition of arsenic. In this way only one dip is used and arsenic is eliminated.

During the year 482 dip samples were received for analysis of strength.

The development at Onderstepoort of a mechanical apparatus for the collection of saliva from various species of ticks, has made it possible to collect relatively large amounts within a short period. Instead of 300 to 400 more than 5 000 ticks can now be handled per day. It was found that when the parasympathetic stimulant pilocarpine, with demethyl sulphoxide as vehicle, was applied directly to the integument of both adult and larval ticks, this is rapidly absorbed and salivary secretion is effectively stimulated. The ticks are not harmed or damaged by this treatment.

This development makes it possible to study the biological and biochemical characteristics of tick saliva, with a view to its rôle in the causation of tick toxicoses and the transmission of infectious diseases.

During the year three new organic phosphate insecticides were tested in the laboratory against resistant strains of *Lucilla cuprina*. Of these only one appeared to give promising results.

Blowfly larvae, collected by the Division of Veterinary Services on farms in the vicinity of Riversdale, were received and tested for resistance. All these specimens proved to be resistant. Further collection from this area should give an indication of the distribution of resistant strains.

With field trials in the Riversdale-Alberthinia area was found that an organic phosphate gave adequate protection against blowfly attack for about six weeks. Thereafter attacks increased, but were limited in extent until the tenth week.

The filarial worm *Parafilaria bovicola* occurs under the skin of cattle in the Northern Transvaal and Northern South West Africa. It is responsible for haemorrhagic serous lesions resembling bruises which can result in the downgrading of carcases and subsequent economic losses.

The female worm living in the tissues just under the skin, liberates her eggs and young stages of the worm in blood which oozes through a small aperture in the skin, and are taken up by an insect transmitter which feeds on this blood. The young stages of the worm’s life cycle are completed in the insect which then transmits the infective stage to another animal. The object of the present study is to identify this insect and the transmission cycle.

The limited studies which have been possible to date suggest that bleeding in cattle occurs during the summer months and that carcase lesions are greatest during this period. The cessation of bleeding in winter can perhaps be coupled with lower mean temperatures. The life-cycle of this worm is unknown, but it is likely that worms survive the winter in their animal hosts and initiate new infestations the following spring, probably through flies.
The work is being continued.

**OTHER VETERINARY RESEARCH**

**Basic research**

*African swine fever* [A.S.F.]

A.S.F. virus has been isolated from an outbreak of disease in the Swakopmund district [S.W.A.]. Electron microscopy has been successfully applied to confirm the diagnosis. A communication in this regard was sent to the O.I.E. meeting held in Paris in May 1972.

The survey to establish the presence of A.S.F. virus in tampans collected from the burrows used by wart-hogs has been initiated. To date 5 out of 16 burrows in the Waterberg district have been found to be infected.

*Clostridium chauvoei: Blackquarter*

The aim of research in this field is to improve the present vaccine and find a rapid method of measuring its potency. Following the finding that the bacterial cells are the most important portion of the vaccine, inducing immunity, various fractions were prepared from washed cells and tested in guinea pigs.

Neither extraction with distilled water nor citrate buffer produced a soluble extract with antigenic properties stronger than those of the residual sediment, although these extracts had a far higher haemolytic index. The cells were also broken up by means of ultrasonic vibration and the supernatent precipitated with polyethylene glycol and ultracentrifuged. All the particulate fractions proved strongly immunogenic, while the soluble fractions were less so.

The most strongly antigenic fractions are at present being used to prepare hyperimmune serum in rabbits in an effort to determine their relative immunogenicity. They are also being used to sensitise red blood cells in comparative indirect haemagglutination tests in an endeavour to find a simple method for determining the potency of the vaccine.

Trials were run on the production of blackquarter vaccine in a large fermentor tank in order to minimise the labour involved in its manufacture. A method of production was eventually settled on and the vaccine is now being produced successfully in bulk.

*Malignant oedema* [Clostridium septicum]

Fluorescent antibody methods are now routinely used in the diagnosis of suspected gas gangrene. *Di. Septicum* was found in smears and then isolated in pure culture from cases of blackquarter in cattle at the Mara Research Station. These animals had been regularly inoculated with blackquarter vaccine. The pathogenesis of the
lesions may be related to small holes in the skin caused by a *Parafilaria* species. An experimental vaccine was produced and is being used with success.

Three outbreaks of gangenous metritis following on partus or abortion in sheep and goats were diagnosed as *Cl. Septicum* infection. The pathogenesis was probably related to crow-peck and lambing under unhygienic conditions.

A survey of post mortem smears using fluorescent antibody techniques is at present being undertaken to investigate the importance attached to finding *Cl. Septicum* in post mortem material. The organism has been found in low concentration in a large percentage of cases, but in high concentration only in cases where the aetiology is suggestive of malignant oedema.

**Clostridium oedematiens** *as a cause of sudden death in sheep and cattle*

A survey of post mortem material by means of the fluorescent antibody technique has been undertaken in order to discover the relative importance that may be attached to finding *Cl. Oedematiens* in post mortem material. The picture is far from clear as yet as the organism has been found in a wide range of species, and the concentration of the organisms on smears is related to the length of time between death and post mortem as well as to the disease found. More cases will have to be investigated in order to find a definite answer.

**Caseous lymphadenitis of sheep**

During the past year further work was undertaken in an attempt to find methods of preparing a more potent vaccine against *Corynebacterium pseudotuberculosis* infection.

Experiments were done in laboratory animals to determine whether the antibody response could be improved by non-specific stimulation. Guinea pigs were given *C. pseudotuberculosis* vaccine simultaneously with some other bacterial vaccines, but this did not lead to higher antibody levels.

Similarly, growing the bacteria in various media had no effect on their antigenicity. Altering the bacteria by ether-ethanol extraction or treatment with detergent also did not improve their antigenicity. It was also shown that sheep are not markedly more refractile to immunisation than other animals.

The effect of high doses of vaccine and immunisation of sheep with live vaccine is currently being investigated.

**Colibacillosis**

*Escherichia coli* has been a problem in the Republic for many years in calves, lambs and pigs, especially owing to the fact that there is a large number of strains which can only be differentiated by serotyping. Most strains are normal, non-pathogenic gut
inhabitants, and the remainder are usually only pathogenic under certain conditions.

The production of O and K typing sera is now completed, and they are being used in routine diagnostic work. A survey has also been started to establish which serotypes are present in South Africa, how pathogenic these strains are, and which species of animals they most commonly affect. The *E. coli* vaccine issued by Onderstepoort contains 14 serotypes of international importance, and it is the aim of the survey to find the most common South African pathogens, so that they can be incorporated into the vaccine, to make the vaccine more effective under our conditions.

With regard to the problem of the poor keeping quality of the *E. coli* vaccine it was found that if the bacterial cells were washed in saline before being incorporated into the vaccine, the vaccine did not become toxic during storage. The *E. coli* vaccine is now again freely available.

In 15 cases the *E. coli* strain prevalent on a farm was not similar to the serotypes incorporated in the vaccine, and special vaccines were made in these cases.

Work has also started on determining the amount of cross-immunity between strains. Cultures with similar O and differing K antigens, as well as cultures with similar K but differing O antigens are being used in trials in mice. If a significant amount of cross-immunity is found to be present fewer strains will need to be incorporated into the vaccine, and the vaccinated animals can build up a better immunity to each strain present in the vaccine.

**The incidence and distribution of mucosal disease [M.D.] in South Africa**

A serological survey to determine the presence of antibodies against M.D. virus in bovine serum samples, originating from various parts of South Africa, has been completed. The results indicated that infection with M.D. virus is widely prevalent among cattle in South Africa.

Locally isolated strains of M.D. virus proved to be serologically closely related to the prototype Oregon C23V strain obtained from the United States of America.

**Serological survey to establish the incidence of porcine enteroviruses responsible for reproductive failures**

The serological survey has been continued. Porcine sera obtained from 20 farms were tested for antibodies to Smed A, B and C viruses and the T80 virus as well. Four hundred neutralization tests were carried out. High levels of antibodies against the above-mentioned viruses are widespread. Of the sera tested, 22 per cent were positive to Smed A, 16 per cent were positive to Smed B, 28 per cent to Smed C and 38 per cent to T80 viruses.
The indirect immunofluorescent technique has been applied to the above-mentioned enteroviruses. It appears that there is a certain degree of cross-reaction amongst all of them.

**Mycoplasma infections in the genital tract of cattle**

[a] **Normal flora of the genital tract of cows**

In view of the possible extension of the work on genital *Mycoplasmas* a survey was made in order to establish a quantitative criterion on the normal genital flora to be expected. Fourteen sets of genitalia were examined and cultures revealed mainly gram positive organisms.

[b] **Typing of Mycoplasma isolates from the genital tracts of cattle**

*Mycoplasmas* are often isolated at Onderstepoort from sheath washings of bulls and vaginal tampons from cows with reduced fertility. Overseas-findings indicate a possible correlation between lowered fertility and *Mycoplasma* infection. Basic research in connection with *Mycoplasmas* of mammals is essential in order to compare the South African findings with those in other countries.

During the year 142 isolates were received from the Section of Reproduction at Onderstepoort. After primary isolated only 72 could be passaged. These were purified by cultural methods and passage. Serologically at least two types could be distinguished among the first 44 isolates. Technique developed by foreign workers were utilised for further biochemical identification with little success. Strains obtained from the *Mycoplasma* Reference Laboratory in London will now be used to control all results.

**Semen examination and fertility investigations**

Fructose determinations are now carried out as a routine on nearly all semen samples processed. These levels are then related to the other semen characteristics and properties evaluated.

Rams exposed experimentally to *Actinobacillus seminis* were examined for fructose levels of ejaculated semen. Although all non-reactors showed a low fructose level, the significance of this observation is not clear at this stage.

Data evaluated from 42 samples collected from bulls by electrical stimulation, rectal massage, and artificial vagina have shown that only samples collected by means of A.V. can be relied on.

**Mechanism of ovulation**

This correlation of clinical data with assay of specimens is continuing. The total plasma protein [TPP] of 25 cows [14 progesterone treated, 8 untreated controls, and 3 ethyl oleate treated controls] has been completed. Progesterone treated cows show a market variation in albumen:globulin ratio, with especially the B2 fraction
showing some interesting changes. The use of this phenomenon as a possible monitor for functional infertility problems is being looked into.

**Production of “Teaser” cows by hormone treatment**

Stilboestrol has been injected in 2 groups of cows. Use of a high dose of stilboestrol has been successful in producing good teaser animals. The incidence of bone fracture, however, has been alarmingly high which tends to detract from this method.

**Hormone determination techniques**

Good progress was made during the year with the determination of gonadotropins by means of radio-immunological techniques, progesterone determination with a protein fixation method developed at the Institute, while similar tests are being used for cortisol determination. Oestrogen analyses have also commenced. With improvements in existing techniques it will shortly be possible to explore the hitherto unknown aspects of fertility problems.

**Mechanism of parturition**

Twenty-five heavily pregnant cows were used in this experiment. Abortion was experimentally produced by means of cortisone treatment in 14 cases. The clinical manifestations were noted and material collected for laboratory assay.

The clinical pathology of the dam and her foetus were compared. Complete haematological examinations revealed a surprisingly close relationship between dam and foetus, with the exception of the total plasma protein and the albumen:globulin ratio. Foetal globulin is very low until colustrum has been taken in. Zinc and copper content are very high in foetal blood, while vitamin A levels are low until colostrum has been consumed.

**Preservation of ram semen**

It appears that excessive handling of the diluted semen is deleterious. On the other hand such semen withstands sever shaking surprisingly well. Karakul and Merino semen has been frozen in milk and in citrate buffer as diluents. The most promising results have been obtained with milk.

Work on the project is continuing.

**Ultrastructure of spermatozoa**

Work on three specific spermatozoan defects is now reaching finality.
A young Charolais bull showed a high percentage of proximal swellings of the midpiece. The stellate appearance on light microscopy made it difficult decide whether the defect was a protoplasmic droplet or mitochondrial derangement. On electron microscopy it was shown that it was a cytoplasmic droplet and a favourable prognosis was given. The conception rate of the bull has subsequently been high.

Investigations are being carried out on loose heads in sperm and seminal tissue. Initial results have shown a distinct implantation groove defect.

A new head-cap defect of sperm in sterile Landrace rams has been demonstrated.

Rumen biochemistry

All research projects but one are concerned either directly or indirectly with the digestion of high fibre diets and the metabolism of the digestive end-products of these by sheep.

The aim has been to work out the physiological basis for the use of high fibre diets supplemented with non-protein-nitrogen compounds and fatty acids in the nutrition of ruminants. This should be of the greatest benefit to the Republic with its millions of sheep and cattle, and millions of tons of roughage produced annually in non-arable regions covering more than three-quarters of the land surface. Knowledge obtained from microbiological studies, including ecological surveys, and batch and continuous cultures in vitro has enabled the manipulation of the ruminal flora to provide the maximum production which ruminants can achieve on high fibre diets. This was done by encouraging the most effective fibre digesters to achieve their maximum growth potential.

A balance sheet of the rates of production of nutrients from the diet by such a ruminal flora functioning at maximum on the one hand and the rates at which these nutrients are utilised by the animal on the other, has indicated that high fibre diets are suitable for maintenance or low production at best. This was found to be due to the inherent slowness of the microbial enzymatic digestion of the cellulose and hemicellulose components of the fibre.

Thus, where really high production is required as in the case of lactating cows and the finishing off of slaughter animals, it becomes necessary to feed a more rapidly fermented source of energy than fibre, such as starch present in grain or sugars in molasses. Thus one new project has been started to study the effect of the rate of change from a high fibre to a high maize-starch diet on the balance of the ruminal flora. At the same extent to which the maximum physiological production potential of the animal itself can be adequately supplied with nutrients produced by ruminal flora characteristic of high maize-starch diets.
Phagocytosis of particulate antigen is important in the induction of antibody synthesis in competent cell system. The phagocytic activity of cells could be accurately determined by means of dioxane extraction after incubation with latex particles. This method is dependent on the characteristic ultraviolet spectrum of latex in dioxane.

It was found that when the bluetongue virus was used as particle, the virus was adsorbed onto the cell membrane of non-phagocytic cells, but is also observed in the cytoplasm of active cells.

This part of the study has been completed.

The success with synthesis of antibodies against bluetongue formerly reported on, could not be satisfactorily repeated. On further investigation the bluetongue virus neutralising activity could be ascribed to the presence of bluetongue virus antibody in the serum of the medium and/or bluetongue infected mice which served as a source of peritoneal exudate cells. On occasion it has been found that bluetongue virus neutralising activity does occur in sera prepared from blood of mice from the Onderstepoort small animal colony. As a result of this uncertainty and the relatively weak antigenicity of bluetongue virus this work has been temporarily suspended.

Further work is now concentrated on sheep red blood cells as antigen. A sensitive titration method dependent on haemolytic plaque formation by commenced to determine the influence of steroid hormones, mainly cortisone, on the immune response. This work is of a provisional nature and includes a histological examination.

Progress is hampered by the wide variations encountered in normal mice. For instance, the spleen serves as a “barometer” of immunological activity of the animal and normal spleens of mice in the local colony vary from 50 to 300 mg. These variations hamper observations on the specific immunological reactions.

Geeldikkop

Research on geeldikkop is conducted in conjunction with the Plant Protection Research Institute and the Section of Agricultural Meteorology, Research Institute for Soil and Irrigation.

It is believed that geeldikkop is caused by a toxic fungus similar to that responsible for facial eczema.

Outbreaks of ovine photosensitivity were investigated in several ecological regions stretching from Underberg [Natal] in the north east, via Swinburne [Natal/Free State border] and Middelburg [Cape] to Stellenbosch in the south, and north through Calvinia [Western Cape] to Gamup, Richtersveld [N.W. Cape]. The epizootiology and pathology of the disease was studied and the mycoflora for the disparate ecological regions was compared in the hope of finding a pattern that might throw light on the aetiology of geeldikkop.
A detailed survey was made of the changing mycoflora on a harvested wheatfield overgrown with *Panicum laevifolium* at Heilbron [Free State]. The changes in mycoflora could be related to sensitive weather data recorded at a weather station erected on the farm. Unfortunately *Panicum* photosensitisation [dikoor] did not break out on the land and so the mycoflora and climate that precede an outbreak could not be determined.

Sensitive weather stations have been erected on eight farms stretching from Heilbron to the Stormriver. In addition existing rainfall and temperature data for the Karoo have been punched on cards for programming. The meteorological research aims at elucidation of the correlation between climate and occurrence of geeldikkop.

*The pathology of Geeldikkop*

The macroscopic, microscopic and ultramicroscopic pathology of geeldikkop in sheep have been intensively studied. The lesions produced in natural cases were found to be identical with those produced experimentally at Grootfontein [Middelburg, Cape] with *Tribulus*.

In the study of the various photosensitisation syndromes a few entities were encountered which do not fit into any of the known syndromes, for instance, a condition provisionally called “Kenhardt hepatosis”, which requires further investigations.

In addition to the above field trials were undertaken in the extermination of meercats on rabies-infected farms in the Ermelo and Piet Retief districts by the placing of poison pellets in meercat burrows, while on infected farms in the Rustenburg district, the large-scale poisoning of jackals with poison bait was investigated.

In collaboration with researchers at the Institute, 156 specimens of *Culicoides* midges, caught at Elsenburg and Tygershoek in the Western Province, as well as meteorological data, were sent to Onderstepoort.

**Research on disease of game**

*Survey of diseases and parasites of the Chacma baboon in the Kruger National Park*

To follow up on the results in last year’s report the final 20 baboons [making a total of 100] were necropsied and studied. New findings include the following:

1. *Toxoplasmosis* – A diagnosis of toxoplasmosis was made serological evidence in 11 baboons. Four of these also showed histopathological evidence [pseudocysts] of the disease in the heart, brain and skeletal muscles. Toxoplasmosis is an important disease in animals and man and therefore the baboon may provide an excellent experimental model for the study of this disease.
2. **Muscular coccidiosis** – Oocysts of the intestinal coccidia, *Isospora papionis*, were found in the skeletal muscle of three baboons. This finding may indicate that carnivores may play a role in the transmission of the disease, which would be an entirely new concept in the study of coccidiosis.

3. A heretofore unrecognized filarid parasite in the subcutis and intermuscular fascia. It has been placed in the genus *Dipetalonema*.

4. Cysticerci of *Taenia crocutae* in the skeletal muscles. The definitive hosts for this tapeworm are the brown hyena *Hyaena brunnea* and spotted hyena *Crocuta crocuta*. This is the first report of these cysticerci being found in baboons.

5. *Schistosoma mattheei* in the mesenteric veins and ova in the liver, mesenteric lymph nodes, and intestine. This finding becomes important when one exports these animals to areas free of Bilharziasis but where the snail vector exists. The baboons could then represent a source of infection unless adequate measures are used in sewage disposal at the laboratory housing these animals.

**Important non-parasitic findings include:**

1. **Capture myopathy** – This disease is of extreme importance in the study of wild animals since it represents an important cause of mortalities among captured game. Moreover, it is comparable to Meyer-Betz disease in man. Therefore it would appear that the free-living baboon would be a useful model for the study of this disease.

2. **Axonal hamaroma in the brain** – Developmental anomalies of the brain are rare in most animals and the finding of this lesion may be important in the study of similar defects in man.

**General**

Extensive capture and acclimatisation experiments have been conducted in the Kruger National Park with various drugs, while spread attention was accorded to the prevention and treatment of overstraining disease, one of the most important mortality factors associated with game capture operations.

In the Western Province, investigations were conducted on the diseases and disease conditions to which game animals in that locality are prone. In the course of this work, 233 animals of various species were examined, and *inter alia* 84 faeces examinations done and analyses carried out of 114 liver, 48 urinary concretion and a large number of blood specimens.
Blood group studies

Cattle

Following the finding that meat extract differs in its chemical nature from one part of an animal to another and from one animal to another, an attempt was made to find similar differences in the enzymes responsible for the various body processes. It was consequently shown that there are not only differences in these enzymes, but in some cases absolute deficiency.

Investigations carried out on 564 animals of dairy herds showed that cows with lactoglobulin type AB had a greater resistance to mastitis than others.

A problem that has enjoyed the attention of many scientists, viz the origin and interrelationship of the indigenous cattle breeds, was brought closer to solution by an intensive investigation [3 356 specimens] into their haemoglobin types. Certain of these breeds viz the Zebu types posses a certain haemoglobin component that is peculiar to them exclusively and can thus become a valuable marker for identification of the influence of these cattle on other breeds.

New theories of cattle relationships and migrations can be brought forward which can assist colleagues from the human sciences who are interested in the migration of human tribes because these tribes were invariably accompanied by their animals.

Horses

Further information was added to the present knowledge regarding the genetic differences between horses. A certain red blood cell enzyme [viz 6-PGD] shows a variety of types that can be used as a means of identification.

Pigs and goats

Investigations were carried out in regard to eight red blood cell enzymes in goats and three in pigs.

Although no difference between enzyme types in aborting and non-aborting Angora goats could be established the work will be continued with other enzyme systems.

Of the enzymes investigated in pigs, sorbitol dehydrogenase is the most important since it is involved directly in the sugar metabolism. The types found could be responsible for better metabolism and faster growth.

Wild Animals

Surveys were conducted on impala, elephant and blesbuck populations, the former two from the Kruger National Park and the latter from Rietvlei Nature Reserve, Pretoria. It was found that there is a large variety of genetic types among impala,
and, to a lesser degree, among elephants. Although the blesbuck were shown by conventional methods to be homogeneous, it was possible to illustrate variations by making use of serological reactions using goat blood grouping antisera.

These studies can be of practical use in the identification of wild animal population and in the study of relationships between and within wild animal species.

**VACCINE PRODUCTION**

The number of vaccines produced by Onderstepoort has increased from 30 to 32 by the addition to the list of a vaccine against rabies in cats and one against infectious bronchitis in poultry.

The total number of doses of all vaccines issued during the year increased by almost 14 per cent from 112 506 383 to 128 171 316, which constitutes a record turnover. The increase is mainly due to the increased use of vaccines against Newcastle disease, fowl pox, lamb dysentery, anthrax, pasteurellosis and lungsickness and the introduction of infectious bronchitis vaccine for poultry.

Apart from the new vaccine against rabies in cats the demand for rabies vaccine for dogs more than doubled due to the increased incidence of the disease during the year. The increase in the use of brucellosis vaccine indicates the progress made with the brucellosis eradication scheme.

A list of issues of vaccines and diagnostic biological products over the past three years is given below.

<table>
<thead>
<tr>
<th>Bacterial Vaccines</th>
<th>1969/70</th>
<th>1970/71</th>
<th>1971/72</th>
</tr>
</thead>
<tbody>
<tr>
<td>Enterotoxaemia</td>
<td>36 355 800</td>
<td>31 977 050</td>
<td>30 923 350</td>
</tr>
<tr>
<td>Lamb dysentery</td>
<td>257 580</td>
<td>307 200</td>
<td>1 070 300</td>
</tr>
<tr>
<td>Lamsiekte [botulism]</td>
<td>4 553 270</td>
<td>4 381 600</td>
<td>3 887 185</td>
</tr>
<tr>
<td>Anthrax</td>
<td>11 559 590</td>
<td>11 424 300</td>
<td>12 222 430</td>
</tr>
<tr>
<td>Blackquarter</td>
<td>4 842 232</td>
<td>4 826 314</td>
<td>4 645 638</td>
</tr>
<tr>
<td>Swelled head of rams</td>
<td>6 600</td>
<td>8 150</td>
<td>24 400</td>
</tr>
<tr>
<td>Brucella [bovine]</td>
<td>844 277</td>
<td>1 175 500</td>
<td>1 447 605</td>
</tr>
<tr>
<td>Brucella [sheep]</td>
<td>352 600</td>
<td>436 650</td>
<td>421 350</td>
</tr>
<tr>
<td>Fowl typhoid</td>
<td>1 337 800</td>
<td>1 567 300</td>
<td>1 785 200</td>
</tr>
<tr>
<td>Calf paratyphoid</td>
<td>290 880</td>
<td>264 285</td>
<td>263 638</td>
</tr>
<tr>
<td>Tetanus</td>
<td>69 190</td>
<td>52 600</td>
<td>60 810</td>
</tr>
<tr>
<td>Corynebacterium pyogenes</td>
<td>145 700</td>
<td>161 520</td>
<td>209 960</td>
</tr>
<tr>
<td>Corynebacterium ovis</td>
<td>276 400</td>
<td>224 320</td>
<td>214 820</td>
</tr>
<tr>
<td>Pasteurella</td>
<td>402 420</td>
<td>345 160</td>
<td>481 880</td>
</tr>
<tr>
<td>Colibacillosis</td>
<td>9 220</td>
<td>25 410</td>
<td>14 940</td>
</tr>
<tr>
<td>Leptospirosis</td>
<td>-</td>
<td>90</td>
<td>2 352</td>
</tr>
<tr>
<td>Lungsickness</td>
<td>-</td>
<td>200 000</td>
<td>1 037 571</td>
</tr>
<tr>
<td></td>
<td>61 303 459</td>
<td>57 377 449</td>
<td>58 713 429</td>
</tr>
</tbody>
</table>
### Virus Vaccines

<table>
<thead>
<tr>
<th>Vaccine</th>
<th>1969/70</th>
<th>1970/71</th>
<th>1971/72</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bluetongue</td>
<td>19 252 450</td>
<td>17 739 650</td>
<td>16 771 600</td>
</tr>
<tr>
<td>Fowl pox</td>
<td>5 154 000</td>
<td>5 699 000</td>
<td>6 680 800</td>
</tr>
<tr>
<td>Pigeon pox</td>
<td>459 200</td>
<td>653 000</td>
<td>684 300</td>
</tr>
<tr>
<td>Rabies [LEP for dogs]</td>
<td>197 730</td>
<td>268 136</td>
<td>437 475</td>
</tr>
<tr>
<td>Rabies [HEP for cats]</td>
<td>-</td>
<td>-</td>
<td>2 936</td>
</tr>
<tr>
<td>Lumpy skin disease</td>
<td>441 973</td>
<td>328 112</td>
<td>320 538</td>
</tr>
<tr>
<td>Horsesickness</td>
<td>110 526</td>
<td>126 573</td>
<td>128 240</td>
</tr>
<tr>
<td>Distemper [dogs and mink]</td>
<td>20 438</td>
<td>21 852</td>
<td>21 105</td>
</tr>
<tr>
<td>Infectious bronchitis</td>
<td>-</td>
<td>-</td>
<td>2 789 200</td>
</tr>
<tr>
<td>Newcastle disease</td>
<td>3 260 600</td>
<td>29 019 600</td>
<td>40 846 400</td>
</tr>
<tr>
<td>Rift Valley fever</td>
<td>3 540 850</td>
<td>296 970</td>
<td>105 790</td>
</tr>
<tr>
<td>Wesselsbron disease</td>
<td>1 148 650</td>
<td>410 710</td>
<td>181 450</td>
</tr>
<tr>
<td></td>
<td>33 586 417</td>
<td>54 563 603</td>
<td>68 969 834</td>
</tr>
</tbody>
</table>

### Other vaccines

<table>
<thead>
<tr>
<th>Vaccine</th>
<th>Units 1969/70</th>
<th>Units 1970/71</th>
<th>Units 1971/72</th>
</tr>
</thead>
<tbody>
<tr>
<td>Heartwater blood</td>
<td>57 310</td>
<td>52 095</td>
<td>52 386</td>
</tr>
<tr>
<td>Anaplasmosis [gallsickness]</td>
<td>452 697</td>
<td>444 613</td>
<td>368 642</td>
</tr>
<tr>
<td>Redwater</td>
<td>70 200</td>
<td>68 623</td>
<td>67 025</td>
</tr>
<tr>
<td></td>
<td>580 207</td>
<td>565 331</td>
<td>488 053</td>
</tr>
<tr>
<td>Grand total</td>
<td>95 470 083</td>
<td>112 506 383</td>
<td>128 171 316</td>
</tr>
</tbody>
</table>

### Diagnostic antigens

<table>
<thead>
<tr>
<th>Antigen</th>
<th>1969/70</th>
<th>1970/71</th>
<th>1971/72</th>
</tr>
</thead>
<tbody>
<tr>
<td>BWD antigen</td>
<td>47 360</td>
<td>37 290</td>
<td>34 755</td>
</tr>
<tr>
<td>Brucella ring test antigen</td>
<td>633</td>
<td>1 191</td>
<td>579</td>
</tr>
<tr>
<td>Mallein</td>
<td>70</td>
<td>110</td>
<td>10</td>
</tr>
<tr>
<td>Tuberculin [bovine]</td>
<td>686 550</td>
<td>411 830</td>
<td>679 670</td>
</tr>
<tr>
<td>Tuberculin [avian]</td>
<td>283 130</td>
<td>226 250</td>
<td>262 430</td>
</tr>
</tbody>
</table>

The following vaccines were produced by State Veterinarians in the field:

- Anaplasmosis: 46 081 doses
- Redwater: 14 731 doses
- Heartwater: 6 908 doses
- Autogenous wart: 5 325 doses
- Contagious pustular dermatitis: 5 437 doses
OTHER VETERINARY SERVICES

Diagnostic services

In the course of diagnostic work, post-mortem examinations were conducted on a total of R3 466 cattle, sheep, goats, pigs, equines, dogs and other animals and 18 930 poultry by professional officers of the Division and on 3 315 poultry at the Research Institute.

At Investigation Centres the following laboratory examinations were carried out:

<table>
<thead>
<tr>
<th>Examination</th>
<th>Count</th>
</tr>
</thead>
<tbody>
<tr>
<td>Brucella agglutination tests</td>
<td>60 017</td>
</tr>
<tr>
<td>Brucella milk ring tests</td>
<td>436</td>
</tr>
<tr>
<td>Vibriosis</td>
<td>2 137</td>
</tr>
<tr>
<td>Leptospirosis</td>
<td>5 488</td>
</tr>
<tr>
<td>Actinobacillus seminis</td>
<td>17 084</td>
</tr>
<tr>
<td>Anti-biograms</td>
<td>703</td>
</tr>
<tr>
<td>Skin scrapings</td>
<td>304</td>
</tr>
<tr>
<td>Faeces examinations</td>
<td>37 583</td>
</tr>
<tr>
<td>Milk examinations [mastitis]</td>
<td>2 930</td>
</tr>
<tr>
<td>Semen</td>
<td>5 015</td>
</tr>
<tr>
<td>Haematological</td>
<td>14 924</td>
</tr>
<tr>
<td>Biochemical</td>
<td>17 489</td>
</tr>
<tr>
<td>Toxicological</td>
<td>602</td>
</tr>
<tr>
<td>Bacteriological</td>
<td>8 079</td>
</tr>
<tr>
<td>Virological</td>
<td>1 136</td>
</tr>
<tr>
<td>Biological</td>
<td>242</td>
</tr>
<tr>
<td>Histopathological</td>
<td>298</td>
</tr>
<tr>
<td>Trichinella examinations</td>
<td>70 574</td>
</tr>
<tr>
<td>Smear examinations</td>
<td>9 913</td>
</tr>
</tbody>
</table>

254 954

The examinations listed below were carried out at the Artificial Insemination Section of the Division at Onderstepoort and at the Research Institute:

<table>
<thead>
<tr>
<th>Examination</th>
<th>A.I. Section</th>
<th>Institute</th>
</tr>
</thead>
<tbody>
<tr>
<td>Brucella abortus [serum]</td>
<td>746</td>
<td>11 515</td>
</tr>
<tr>
<td>Brucella abortus [sperm]</td>
<td>178</td>
<td></td>
</tr>
<tr>
<td>Brucella ovis [serum]</td>
<td></td>
<td>2 241</td>
</tr>
<tr>
<td>Vibriosis</td>
<td>498</td>
<td>788</td>
</tr>
<tr>
<td>Leptospirosis</td>
<td>521</td>
<td>2 354</td>
</tr>
<tr>
<td>IPV/IBR [serum]</td>
<td>236</td>
<td></td>
</tr>
<tr>
<td>IPV/IBR [sperm]</td>
<td>166</td>
<td></td>
</tr>
<tr>
<td>Bacteriological [sperm]</td>
<td>217</td>
<td></td>
</tr>
<tr>
<td>Johne’s disease</td>
<td></td>
<td>126</td>
</tr>
<tr>
<td>Rift Valley fever</td>
<td>41</td>
<td></td>
</tr>
<tr>
<td>Sheath washings</td>
<td>5 492</td>
<td></td>
</tr>
<tr>
<td></td>
<td>8 095</td>
<td>17 024</td>
</tr>
</tbody>
</table>
Surveys

In conjunction with Onderstepoort a survey is being conducted in the Northern Transvaal to determine the incidence of *Parafilaria bovicola*. In the Soutpansberg district the incidence of *Culicoides* spp. is being determined.

In a survey of contagious abortion in bulls, oxen and non-immunised heifers in the Bantu areas in the Pietersburg State Veterinary area, 30 per cent of bulls and 46 per cent of oxen were found infected.

A large number of bone and liver specimens were collected for a comprehensive trace element and calcium and phosphorus survey in the Kruger National Park.

The survey to determine the mineral status of several domestic species in the Winter Rainfall Region was continued during the year.

In the Calvinia area the presence and prevalence of various internal and external parasites in different parts of the area were surveyed, in an effort to gain detailed knowledge in respect of parasites, for improved extension work amongst farmers.

Clinical services

As in the past in those areas where the services of private veterinary practitioners were not available State Veterinarians rendered clinical services when not prevented from doing so by their official duties. In addition, veterinary services were also provided for State-owned herds and flocks.

During the year R23 650,44 was collected for professional services, R7 384,23 for transport fees and R19 098,14 for vaccines sold by State Veterinary Offices, while laboratory fees amounted to R1 491,53, fees for meat inspection at export abattoirs to R40 618,96 and quarantine station fees to R4 653,89.

Artificial insemination services

For the annual re-registration of bulls standing at the A.I. Co-operatives and individual breeders and the registration of new bulls intended for A.I. service, the A.I. and Reproduction Section of the Division examined 127 bulls during the year.

In view of the reliability of the fluorescent antibody plus culture test for vibriosis it was decided during the year to discontinue the heifer test for new bulls.

One A.I. Station bull, positive for IPV and with a high abnormal sperm count, was not recommended for re-registration, and was withdrawn from service. At the moment there are still 6 IPV positive bulls at A.I. Stations. These bulls are subject to regular semen examinations. No semen specimens from these bulls proved positive during the year.

As in previous years, a number of bulls with sperm abnormality counts higher than the statutory 20 per cent were conditionally re-registered. The bulls maintained entirely satisfactory conception rates.
During 1971 approximately 161,000 cows were inseminated in the Republic, compared to 144,000 in 1970. Of these, 128,000 were dairy animals and 33,000 beef cattle.

An unmistakable swing from insemination by inseminators to insemination by the owner or an employee has been noted. In the Transvaal, for instance, inseminations by registered inseminators decreased from 27,341 in 1970 to 23,984 in 1971, while total inseminations increased from 150,018 to 181,311 during the same period.

At Potchefstroom 14 cattle and 2 sheep A.I. courses were attended by 154 farmers who wished to apply A.I. in their own herds or flocks.

Three one-week courses, attended by 10 persons per course, were presented during May 1972 at Cedara [Pietermaritzburg].

A four-day course, attended by 10 persons, was arranged by the State Veterinarian at Barberton.

At Glen [Bloemfontein] two courses were held, during November 1971 and March 1972. The former was for students and the latter for farmers, and in both cases assistance was given by the A.I. Section.

Four courses, for prospectives inseminators, were held at Onderstepoort. Of the 55 students attending, 52 qualified.

In addition to these four courses, the A.I. Section of the Division presented two A.I. courses for Bantu persons: in the first, held near Tolwe in the Potgietersrus district during February 1972, 7 of the 10 candidates passed; at the second, held in May 1972 near Perdekop in the Standerton district, 10 of the 15 candidates were successful. It is of interest to note that 80 per cent of the candidates were illiterate.

**HEALTH SCHEMES**

**Bacillary white diarrhoea**

Details of the tests performed and certificates issued during 1971/72 are tabulated below:

<table>
<thead>
<tr>
<th>Region</th>
<th>Flocks</th>
<th>Tests Total</th>
<th>Fowls Pos.</th>
<th>Susp.</th>
<th>Holders</th>
<th>Fowls</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cape East &amp; Karoo</td>
<td>2</td>
<td>4,421</td>
<td>-</td>
<td>-</td>
<td>2</td>
<td>16,297</td>
</tr>
<tr>
<td>Highveld</td>
<td>13</td>
<td>48,659</td>
<td>10</td>
<td>-</td>
<td>12</td>
<td>195,612</td>
</tr>
<tr>
<td>Natal</td>
<td>15</td>
<td>436,637</td>
<td>-</td>
<td>-</td>
<td>15</td>
<td>436,637</td>
</tr>
<tr>
<td>O.F.S.</td>
<td>2</td>
<td>3,894</td>
<td>-</td>
<td>-</td>
<td>3</td>
<td>4,321</td>
</tr>
<tr>
<td>Transvaal</td>
<td>24</td>
<td>38,438</td>
<td>113</td>
<td>70</td>
<td>25</td>
<td>283,090</td>
</tr>
<tr>
<td>Winter Rainfall</td>
<td>29</td>
<td>270,133</td>
<td>-</td>
<td>14</td>
<td>29</td>
<td>899,900</td>
</tr>
<tr>
<td>Total</td>
<td>85</td>
<td>802,182</td>
<td>123</td>
<td>84</td>
<td>86</td>
<td>1,835,857</td>
</tr>
</tbody>
</table>

100/…
P.P.L.O. scheme

The data of tests performed is summarised below:

<table>
<thead>
<tr>
<th>Region</th>
<th>Fowls tested</th>
<th>Certificate holders</th>
<th>Tests on-certified flocks</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Total</td>
<td>Pos.</td>
<td>Susp.</td>
</tr>
<tr>
<td>Highveld</td>
<td>4 392</td>
<td>25</td>
<td>-</td>
</tr>
<tr>
<td>Natal</td>
<td>5 597</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>O.F.S.</td>
<td>393</td>
<td>-</td>
<td>28</td>
</tr>
<tr>
<td>Transvaal</td>
<td>32 732</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Winter Rainfall</td>
<td>46 915</td>
<td>1 166</td>
<td>108</td>
</tr>
<tr>
<td>Total</td>
<td>90 029</td>
<td>1 191</td>
<td>136</td>
</tr>
</tbody>
</table>

Pig recording and health scheme

The position remained virtually unchanged with an increase in membership from 38 to 42 during the year, but the number of pigs decreasing from 19 665 to 18 185.

FOOD HYGIENE

The results of the statement on marketing policy issued during the year, in terms of which important concessions were granted to private enterprise in the abattoir industry, were immediately felt.

The technical branch of the Meat Hygiene Section of the Division checked the proposed plans of 11 public and 43 private abattoirs to ensure that these would comply with the hygiene requirements of Act 87 of 1967. Proposed plans for improvements to 17 existing public and 3 private abattoirs, as well as plans for the erection of new abattoirs, were also dealt with.

Two private and one public abattoir were completed and taken into use. In all these cases the new abattoirs replaced obsolete ones, and the standard of hygiene was raised to level to which the consumer is entitled. A further 5 new public and one private abattoir are rapidly nearing completion, and should soon be ready to be taken into use.

The take-over of the abattoirs within the controlled area by the Abattoir Commission has resulted in improvements being effected which will raise standard of hygiene. Structural changes at the Germiston and Benoni Abattoirs are progressing as planned, while improvements at the Springs Abattoir are still in the planning stages.

This take-over also resulted in the Division assuming responsibility for meat inspection services at the abattoirs mentioned, by means of 12 Meat Inspectors, one State Veterinarian and one part-time veterinarian.
Certificates of Approval in respect of 42 new abattoirs or abattoirs that had undergone a change of ownership were issued during the year, while 24 certificates were cancelled in respect of abattoirs that had closed down or changed ownership.

A poultry abattoir with a daily throughput of approximately 3 000 birds was erected, while one large and 4 smaller poultry abattoirs are in the planning stage.

State Veterinarians carried out 62 inspections at abattoirs and pointed out to owners defects and deficiencies in terms of the provisions of Act 87 of 1967.

During January 1972 an inspector of the Department of Agriculture, Food and Fisheries of the United Kingdom visited the Republic to inspect abattoirs and meat processing plants. As a result of his findings, all municipal abattoirs in the Republic were found unsuitable for export to the United Kingdom, while 6 meat processing plants, three of which run their own private abattoirs, retained their export licenses.

In South West Africa one municipal and two private abattoirs and three meat processing plants were approved for export to the United Kingdom.

Those concerned with the meat export trade have now realised that Western importing countries are only satisfied with the highest standards of hygiene in the handling of meat and meat products and efforts are being made to improve both premises and management.

The Meat Hygiene Section is fully aware that, in view of the ever increasing demands created by the expansion of the European Common Market, it will have to continue with advice and guidance to exporters to enable them to meet the required standards.

**Remindering rough edible offal hygienically acceptable**

Further studies were carried out at the Institute to determine the effect of hot pickling on ruminal offal. From these studies it appears possible to remove pathogenic, non-sporing bacteria from ruminal offal by hot pickling. However, the apparent ability of these as well as non-specific aerobic and anaerobic bacteria to survive and increase on previously pickled material, indicates the danger of post-pickling contamination by pathogens and poor keeping quality of such offal during storage.

**Drug resistance and R-factors in Escherichia coli**

The study was intended to provide information regarding the occurrence of R-factors in *E. coli*. These factors *inter alia* are responsible for single or multiple drug resistance and transfer thereof to sensitive organisms of the Enterobacteriaceae.

Antibiotics are used to promote growth and control stress and subclinical as well as clinical infections in farm animals, and there is a world-wide concern about the hazards which may result from extended use. Some of these hazards are interspecies transmission of bacteria, acquired bacterial drug resistance and contamination of food of animal origin with R-positive strains of bacteria.
Of *E. coli* 224 strains were isolated from apparently normal calves, diseased calves and pigs, raw meat and raw milk and examined. A high percentage of strains were resistant to either a single antibiotic or showed multiple drug resistance and many of these possessed R-factors. In calves the incidence varied from 100 per cent in animals from intensive units, exposed to antibiotics, down to 7 per cent in calves originating from ranches where exposure to antibiotics was minimal.

These results support findings in other countries i.e. that whereas simple non-transmissible drug resistance and the odd R+ organisms occur in bacterial populations not exposed to man-made antibiotics, their incidence rises dramatically where antibiotics are used in animal rearing programmes.

**STOCK INSPECTION SERVICES**

The foot and mouth disease infection in the Kruger National Park, throughout the year constituted an ever present threat to the adjacent stock farming areas, necessitating intensified short interval stock inspections, for which additional personnel had to be drafted into these areas.

Large numbers of the inspectorate staff were also for varying periods absent from their normal areas on other duties such as from instance campaigns in connection with outbreaks of Newcastle disease and sheep scab. All this led to a disruption of the normal stock inspection service of the Division.

In summarising it can be stated that the inspectorate branch of the Division, so absolutely indispensable for the protection of the welfare of the stock industry of the Republic, once again proved its flexibility and adaptability.

**ANIMAL HEALTH EXTENSION SERVICE**

Only the soundest stock farming practices are admissible. This is especially the case in our rapidly developing country with its swiftly expanding economy where there is a real danger that the demand for products of animal origin may outstrip the supply.
Not only do the interests of the national economy demand scientifically based methods of animal husbandry, but also the economic welfare of the individual farmer. The financial losses in stock farming due to easily preventable causes are colossal and it is inconceivable that anybody aware of the facts could be complacent about thematter.

Being fully aware of the position the Division does everything in its power to convince stock owners of the advantage of utilising the accumulated mass of scientific knowledge available.

During the year articles were prepared for the rural press and national agricultural journals and Departmental publications; film shows of veterinary interest were presented, usually accompanied by explanatory lectures; pamphlets were drawn up; farmers’s study groups were assisted by means of lectures and discussions; lectures covering a wide spectrum of subjects were delivered; by means of personal interviews valuable and very effective extension work was done.

**IMPORT AND EXPORT CONTROL**

**Import**

The control and regulation of the importation of animals, products and any other materials that could introduce animal diseases into the Republic, is one of the major functions of the Division of Veterinary Services.

During the year the animals listed below were imported for slaughter, farming or other purposes:

<table>
<thead>
<tr>
<th>Animal</th>
<th>Quantity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cattle</td>
<td>11 725</td>
</tr>
<tr>
<td>Sheep</td>
<td>27 396</td>
</tr>
<tr>
<td>Goats</td>
<td>12 536</td>
</tr>
<tr>
<td>Pigs</td>
<td>22</td>
</tr>
<tr>
<td>Horses</td>
<td>238</td>
</tr>
<tr>
<td>Dogs</td>
<td>1 508</td>
</tr>
<tr>
<td>Cats</td>
<td>362</td>
</tr>
<tr>
<td>Birds</td>
<td>148 116</td>
</tr>
<tr>
<td>Primates</td>
<td>196</td>
</tr>
<tr>
<td>Mink</td>
<td>24</td>
</tr>
<tr>
<td>Wild animals</td>
<td>163</td>
</tr>
<tr>
<td>Tropical fish</td>
<td>1 286 597</td>
</tr>
<tr>
<td>Crocodiles</td>
<td>11</td>
</tr>
<tr>
<td>Rabbits</td>
<td>80</td>
</tr>
<tr>
<td>Frogs</td>
<td>24</td>
</tr>
<tr>
<td>Ticks</td>
<td>24</td>
</tr>
<tr>
<td>Insects</td>
<td>25</td>
</tr>
</tbody>
</table>
The table below gives an indication of the variety of products imported on permits issued by the Division:

<table>
<thead>
<tr>
<th>Product</th>
<th>Quantity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Biltong</td>
<td>5 349 kg</td>
</tr>
<tr>
<td>Frozen meat</td>
<td>9 000,003 kg</td>
</tr>
<tr>
<td></td>
<td>34 695 carcasses</td>
</tr>
<tr>
<td></td>
<td>11 102 cartons</td>
</tr>
<tr>
<td></td>
<td>6 620 bales</td>
</tr>
<tr>
<td></td>
<td>725 cases</td>
</tr>
<tr>
<td></td>
<td>20 packages</td>
</tr>
<tr>
<td>Cattle offal</td>
<td>3 trucks</td>
</tr>
<tr>
<td>Sausage casings</td>
<td>187 kg</td>
</tr>
<tr>
<td></td>
<td>3 320 tierces</td>
</tr>
<tr>
<td>Cream</td>
<td>642 033 liter</td>
</tr>
<tr>
<td>Butter</td>
<td>53 924 cartons</td>
</tr>
<tr>
<td>Goose livers</td>
<td>50 kg</td>
</tr>
<tr>
<td>Hides and skins</td>
<td>943 249 kg</td>
</tr>
<tr>
<td></td>
<td>9 674 bales</td>
</tr>
<tr>
<td></td>
<td>950 192 units</td>
</tr>
<tr>
<td>Wet salted hides</td>
<td>281 874 kg</td>
</tr>
<tr>
<td></td>
<td>1 509 bags</td>
</tr>
<tr>
<td></td>
<td>4 197 units</td>
</tr>
<tr>
<td>Karakul pelts</td>
<td>24 002 units</td>
</tr>
<tr>
<td>Bone meal</td>
<td>2 886 t</td>
</tr>
<tr>
<td>Carcass meal</td>
<td>277 t</td>
</tr>
<tr>
<td>Hair and bristles</td>
<td>9 378 kg</td>
</tr>
<tr>
<td></td>
<td>498 cases</td>
</tr>
<tr>
<td>Wool</td>
<td>583 570 kg</td>
</tr>
<tr>
<td></td>
<td>10 691 bales</td>
</tr>
<tr>
<td>Rabbit fur</td>
<td>39 543 kg</td>
</tr>
<tr>
<td>Ostrich feathers</td>
<td>634 kg</td>
</tr>
<tr>
<td>Feathers</td>
<td>8 306 kg</td>
</tr>
<tr>
<td></td>
<td>40 bales</td>
</tr>
<tr>
<td>Tallow</td>
<td>35 800 kg</td>
</tr>
<tr>
<td></td>
<td>458 drums</td>
</tr>
<tr>
<td></td>
<td>1 205 kg</td>
</tr>
<tr>
<td>Casein</td>
<td>4 686 bags</td>
</tr>
<tr>
<td>Elephant tusks</td>
<td>160 units</td>
</tr>
<tr>
<td>Processed skins and trophies</td>
<td>1 480 units</td>
</tr>
<tr>
<td>Mineral stock feed</td>
<td>560 bags</td>
</tr>
<tr>
<td>Second hand bags</td>
<td>508 533 units</td>
</tr>
<tr>
<td></td>
<td>489 bales</td>
</tr>
<tr>
<td>Veterinary drugs</td>
<td>250 cartons</td>
</tr>
<tr>
<td></td>
<td>40 drums</td>
</tr>
<tr>
<td>Trout eggs</td>
<td>755 000 units</td>
</tr>
<tr>
<td>Semen</td>
<td>559 amps.</td>
</tr>
</tbody>
</table>
Export

For export purposes, veterinary examination and certification in accordance with the requirements of importing countries were undertaken in respect of the following animals:

- Cattle: 9,091
- Sheep: 2,999
- Goats: 478
- Pigs: 3,850
- Equines: 598
- Dogs: 1,967
- Cats: 263
- Birds: 18,208
- Poultry: 1,395,439
- Wild animals: 134
- Other animals: 602
- Reptiles: 33
- Fish: 62
- Frogs: 50
- Bats: 12

The products listed below were certified for export:

- Frozen and chilled meat: 141,942 t
  - 8,537 cartons
- Canned meat: 6,320 t
- Poultry meat: 6,000 carcasses
- Springbuck meat: 10 carcasses
- Bacon: 180,213 kg
- Whale meat: 23,528 cartons
  - 2,113 packages
- Whale meat extract: 2,728 cases
  - 5,176 tins
- Sausage casings: 96,414 kg
- Eggs: 110 cases
- Hides and skins: 7,763,370 kg
  - 71,973 bales
  - 254,010 units
  - 43,936 pieces
  - 2,831 drums
- Ostrich skins: 614 kg
- Karakul pelts: 1,540,584 units
  - 57 bales
- Horns and hooves: 97,219 kg
  - 6,989 bags
  - 21,690 bales
- Horn and hoof meal: 80,000 kg
<table>
<thead>
<tr>
<th>Product</th>
<th>Quantity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Blood and carcass meal</td>
<td>11 751 bags</td>
</tr>
<tr>
<td>Fish meal</td>
<td>173 425 kg</td>
</tr>
<tr>
<td>Whale protein meal</td>
<td>207 966 bags</td>
</tr>
<tr>
<td>Molasses meal</td>
<td>22 463 bags</td>
</tr>
<tr>
<td>Citrus meal</td>
<td>1 575 bags</td>
</tr>
<tr>
<td>Lucerne</td>
<td>2 t</td>
</tr>
<tr>
<td>Hair and bristles</td>
<td>19 752 kg</td>
</tr>
<tr>
<td>Wool</td>
<td>2 729 666 kg</td>
</tr>
<tr>
<td>Ostrich feathers</td>
<td>253 kg</td>
</tr>
<tr>
<td>Feathers</td>
<td>782 747 kg</td>
</tr>
<tr>
<td>Ox gall</td>
<td>32 t</td>
</tr>
<tr>
<td>Glue</td>
<td>15 600 kg</td>
</tr>
<tr>
<td>Egg shells</td>
<td>894 kg</td>
</tr>
<tr>
<td>Poultry feed</td>
<td>17 099 251 kg</td>
</tr>
<tr>
<td>Stock feed</td>
<td>51 462 bags</td>
</tr>
<tr>
<td>Cotton seed meal</td>
<td>289 t</td>
</tr>
<tr>
<td>Oil cake meal</td>
<td>47 591 bags</td>
</tr>
<tr>
<td>Bran</td>
<td>47 591 bags</td>
</tr>
<tr>
<td>Processed skins and trophies</td>
<td>1 719 units</td>
</tr>
<tr>
<td>Ostrich egg shells</td>
<td>706 cases</td>
</tr>
<tr>
<td>Elephant skin</td>
<td>3 t</td>
</tr>
<tr>
<td>Ivory</td>
<td>10 917 kg</td>
</tr>
<tr>
<td>Lamb paunches</td>
<td>5 130 kg</td>
</tr>
<tr>
<td>Grains</td>
<td>134 575 t</td>
</tr>
<tr>
<td>Beans</td>
<td>11 072 kg</td>
</tr>
<tr>
<td>Peas</td>
<td>664 500 kg</td>
</tr>
<tr>
<td>Sweet corn</td>
<td>450 kg</td>
</tr>
<tr>
<td>Lupin seed</td>
<td>2 030 kg</td>
</tr>
<tr>
<td>Potatoes</td>
<td>3 942 t</td>
</tr>
<tr>
<td>Onions</td>
<td>2 800 bags</td>
</tr>
<tr>
<td>Dry flowers</td>
<td>225 kg</td>
</tr>
<tr>
<td>Musk melon</td>
<td>212 kg</td>
</tr>
<tr>
<td>Grapes</td>
<td>12 355 344 kg</td>
</tr>
</tbody>
</table>

**TRAINING**

**Vetermarians**

The activities concerning pre- and post-graduate education took a normal course during the year. An increasing number of foreign students apply particularly for pre-graduate study. During the past year more than 50 applications were received from the U.S.A.
Extension of the Faculty to accommodate 90 students per class remains an urgent necessity, as this will simultaneously make provision for certain facilities at the moment lacking in some departments.
The number of students registered for the 1972 academic year is:

- B.V.Sc. II: 46
- B.V.Sc. III: 48
- B.V.Sc. IV: 51
- B.V.Sc. V: 41
- B.V.Sc. V ½: 3
- M.Med.Vet.: 46
- D.V.Sc.: 12
- D.V.V.G.: 4

Degrees awarded [September 1971 – March 1972]:

- M.Med.Vet.: 2
- D.V.Sc.: 0
- D.V.V.G.: 0
- B.V.Sc.: 36

**STOCK CENSUS**

<table>
<thead>
<tr>
<th>Region</th>
<th>Cattle*</th>
<th>Sheep</th>
<th>Goats</th>
<th>Horses</th>
<th>Donkeys And Mules</th>
<th>Pigs</th>
<th>Fowls</th>
<th>Dogs</th>
<th>Chin-chillas</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Woolled</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Non-woolled</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cape East and Karoo</td>
<td>974 648</td>
<td>8 491 998</td>
<td>1 382 055</td>
<td>1 418 564</td>
<td>39 761</td>
<td>16 392</td>
<td>97 646</td>
<td>1 795 022</td>
<td>110 292</td>
</tr>
<tr>
<td>Eastern</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Transvaal</td>
<td>1 002 748</td>
<td>49 680</td>
<td>258 016</td>
<td>558 348</td>
<td>2 822</td>
<td>38 371</td>
<td>64 641</td>
<td>942 851</td>
<td>69 207</td>
</tr>
<tr>
<td>Highveld</td>
<td>2 742 811</td>
<td>4 648 789</td>
<td>591 185</td>
<td>224 798</td>
<td>99 817</td>
<td>21 795</td>
<td>278 219</td>
<td>2 986 702</td>
<td>171 274</td>
</tr>
<tr>
<td>Natal</td>
<td>2 653 939</td>
<td>1 655 864</td>
<td>231 475</td>
<td>927 255</td>
<td>47 797</td>
<td>54 849</td>
<td>141 462</td>
<td>4 686 306</td>
<td>211 233</td>
</tr>
<tr>
<td>O.F.S.</td>
<td>1 294 583</td>
<td>2 971 332</td>
<td>3 707 870</td>
<td>682 750</td>
<td>56 650</td>
<td>46 438</td>
<td>94 320</td>
<td>890 956</td>
<td>73 010</td>
</tr>
<tr>
<td>Transvaal Winter</td>
<td>2 159 973</td>
<td>1 827 946</td>
<td>431 620</td>
<td>498 382</td>
<td>37 873</td>
<td>36 015</td>
<td>292 708</td>
<td>9 355 754</td>
<td>158 305</td>
</tr>
<tr>
<td>Rainfall</td>
<td>316 759</td>
<td>2 520 044</td>
<td>860 780</td>
<td>375 097</td>
<td>22 325</td>
<td>11 144</td>
<td>134 721</td>
<td>4 921 771</td>
<td>91 998</td>
</tr>
<tr>
<td>Total</td>
<td>11 145 461</td>
<td>22 165 653</td>
<td>7 463 001</td>
<td>4 685 194</td>
<td>307 045</td>
<td>225 004</td>
<td>1 103 171</td>
<td>25 579 362</td>
<td>885 319</td>
</tr>
</tbody>
</table>

Other veterinary training

At all the Agricultural Colleges, including the Bantu College at Fort Hare, State Veterinarians were, as in the past, responsible for the veterinary subjects for the diploma course.

At Fort Cox the veterinary course for Bantu Assistant Stock Inspectors was conducted by the State Veterinarian, East London.

Preparation of the lectures for the formal in-service training course for members of the stock inspectorate branch of the Division are nearing completion. Two State Veterinarians attached to the office of the Director of Veterinary Services are engaged on this all important task. These lectures are to be multiplied and will eventually be supplied to all stock inspectorate personnel prior to their attendance of the projected training courses, which will extend over a period of approximately one month. This training is intended to equip all staff members for more efficient performance of their duties.
The first course, for senior members of the personnel, will be held during September 1972 and will be repeated at intervals until all inspectorate personnel have received the necessary training.

**LEGISLATION**

During the report year the following Government Notices were published under the Acts indicated:

**Animal Diseases and Parasites Act [Act 13 of 1956]**


*Please refer to next table for analysis of cattle figures*

<table>
<thead>
<tr>
<th>Region</th>
<th>White areas</th>
<th>Non-White areas</th>
<th>White areas</th>
<th>Non-White areas</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cape East &amp; Karoo</td>
<td>764 026</td>
<td>2 313</td>
<td>33 240</td>
<td>175 069</td>
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<tr>
<td>Eastern Transvaal</td>
<td>441 592</td>
<td>11 443</td>
<td>28 425</td>
<td>521 288</td>
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<tr>
<td>Highveld</td>
<td>2 423 820</td>
<td>1 798</td>
<td>180 228</td>
<td>136 965</td>
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<tr>
<td>Natal</td>
<td>1 119 976</td>
<td>577</td>
<td>274 655</td>
<td>1 258 731</td>
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<tr>
<td>O.F.S.</td>
<td>1 146 432</td>
<td>78</td>
<td>11 798</td>
<td>136 275</td>
</tr>
<tr>
<td>Transvaal</td>
<td>1 687 851</td>
<td>51 048</td>
<td>95 600</td>
<td>325 474</td>
</tr>
<tr>
<td>Winter Rainfall</td>
<td>314 251</td>
<td>216</td>
<td>585</td>
<td>1 707</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>7 897 948</strong></td>
<td><strong>67 473</strong></td>
<td><strong>624 531</strong></td>
<td><strong>2 555 509</strong></td>
</tr>
</tbody>
</table>

**Animal Slaughter, Meat and Animal Products Hygiene Act [Act 87 of 1967]**

[a] G.N. R.2028 dated 12.11.71 to repeal G.N. R.3456 dated 3.10.69 and substitute different grounds for the exemption from the provision of Act 87 of 1967 of animals slaughtered by owners of land for private purposes.


**TECHNICAL RELATIONS WITH OTHER COUNTRIES**

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

Eight scientists from Botswana, Kenya and Mocambique visited the Institute during the year. Apart from the above, two persons from Mocambique are at the moment engaged on post-graduate study at the Institute and Faculty.

The tick survey in Botswana, with which the Institute assisted, has been completed and a report for publication is being prepared jointly. This will give a comprehensive review of tick distribution in Botswana.
The following vaccines prepared by the Institute were supplied to African territories:

- Angola: 240,455 doses of 2 vaccines
- Botswana: 203,459 doses of 20 vaccines
- Lesotho: 215,020 doses of 17 vaccines
- Malawi: 692,200 doses of 12 vaccines
- Mocambique: 10,608 doses of 2 vaccines
- Rhodesia: 2,890,484 doses of 19 vaccines
- Swaziland: 618,337 doses of 20 vaccines
- Zaire [Congo]: 10,510 doses of 3 vaccines
- Zambia: 1,661,550 doses of 9 vaccines

Under “Trypanosomiasis” details were given of the joint Rhodesia – Angola – Mocambique – South Africa operations in tsetse fly eradication. It is of interest to note that in the 10 year period 1962-72 a total area of 10,950 km² — including 2,250 km² on the Mocambique side of the Rhodesia-Mocambique border — has been freed of tsetse fly.

At the request of the respective Governments officials of the Division of Veterinary Services visited Rhodesia, Swaziland and Lesotho during the year for inspections of and consultations in connection with export abattoirs in these countries.

Liaison with overseas countries

Scientific visitors

During the course of the year 51 scientists from 19 different overseas countries visited the Institute for varying periods, to have discussions and obtain information, mainly on diseases peculiar to Africa.

Three visitors from Australia, two from West-Germany, one from the U.S.A. and one from Italy spent longer periods as guest workers at the Institute.

Apart from the above 395 foreign tourists in organised groups visited the Institute.

Technical assistance and advice

Bluetongue World Reference Centre [O.I.E]

Once again this Institute has been called upon to assist overseas countries in the diagnosis of bluetongue. This has entailed the continued preparation of reference antigens and anti-sera.

A sample of virus isolated from Culicoides in Nigeria would appear to represent a new immunological type. From Italy a consignment of 267 cattle sera were examined for evidence of previous infection by bluetongue virus. Investigations were completed on the typing of samples from Egypt.
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