

UNION OF SOUTH AFRICA.

COMMISSION.

BY HIS EXCELLENCY THE RIGHT HONOURABLE SIR JAMES ROSE-INNES, A MEMBER OF HIS MAJESTY'S MOST HONOURABLE PRIVY COUNCIL, KNIGHT COMMANDER OF THE MOST DISTINGUISHED ORDER OF ST. MICHAEL AND ST. GEORGE, OFFICER ADMINISTERING THE GOVERNMENT OF THE UNION OF SOUTH AFRICA.

Presented to both Houses of Parliament by Command of His Royal Highness the Governor-General.

To :—

HEINRICH SEBASTIAN DAVEL-DU TOIT, D.T.D.
SELBY MONTAGUE GADD, ESQUIRE.
GEORGE AUGUSTUS KOLBE, ESQUIRE.
ARTHUR STEAD, B.Sc., F.C.S.
REENEN JACOB VAN REENEN, B.A., C.E., A.M.I.C.E.

GREETING :

WHEREAS it is considered advisable to appoint a Commission to enquire into the best means of avoiding losses by drought.

NOW THEREFORE I, the Officer Administering the Government aforesaid, do by this Commission appoint you :—

HEINRICH SEBASTIEN DAVEL-DU TOIT
SELBY MONTAGUE GADD
GEORGE AUGUSTUS KOLBE
ARTHUR STEAD
REENEN JACOB VAN REENEN,

with Heinrich Sebastian Davel-du Toit as Chairman, as Members of a Commission to investigate and report upon :—

- (1) The methods by which losses to farmers owing to periodic droughts in the drier parts of the Union may be prevented, either by public or private action ; and in particular whether any changes in farming methods are necessary for this purpose ;
- (2) Any improvements in farming conditions generally such as the provision of more water, prevention of soil erosion, and any other matters which have a close bearing on point 1.
- (3) The methods by which indigency arising among the farming community in consequence of such losses could best be dealt with.
- (4) The production of feeding by the cultivation of various grasses.

AND I do hereby desire and request that you do, as soon as the same can be conveniently done, using all diligence, report to me in writing your proceedings by virtue of this Commission.

AND I further will and direct and by these presents ordain that this Commission shall continue in force until you shall have finally reported upon the matters aforesaid or otherwise until the commission shall be by me revoked.

AND LASTLY, I do hereby desire and direct that all public officers in the Union, as well as all His Majesty's subjects be assistant to you in the execution of these presents by giving all such information as it may be in their power to impart.

IN WITNESS whereof I have caused this Commission to be issued this 24th day of September in the year of our Lord One Thousand Nine Hundred and Twenty.

GOD SAVE THE KING !

GIVEN under my hand and the Great Seal of the Union of South Africa this 24th day of September in the year of our Lord One Thousand Nine Hundred and Twenty.

(Sgd.) J. ROSE-INNES,

Officer Administering the Government.

By command of His Excellency the Officer administering the Government in Council,

(Sgd.) N. J. DE WET,

FINAL REPORT.

TO MAJOR-GENERAL HIS ROYAL HIGHNESS PRINCE ARTHUR FREDERICK PATRICK ALBERT OF CONNAUGHT, KNIGHT OF THE MOST NOBLE ORDER OF THE GARTER, A MEMBER OF HIS MAJESTY'S MOST HONOURABLE PRIVY COUNCIL, KNIGHT OF THE MOST ANCIENT AND MOST NOBLE ORDER OF THE THISTLE, KNIGHT GRAND CROSS OF THE MOST DISTINGUISHED ORDER OF SAINT MICHAEL AND SAINT GEORGE, KNIGHT GRAND CROSS OF THE ROYAL VICTORIAN ORDER, COMPANION OF THE MOST HONOURABLE ORDER OF THE BATH, PERSONAL AIDE-DE-CAMP TO HIS MAJESTY THE KING, HIGH COMMISSIONER FOR SOUTH AFRICA, AND GOVERNOR-GENERAL AND COMMANDER-IN-CHIEF IN AND OVER THE UNION OF SOUTH AFRICA.

May it please your Royal Highness,—

In terms of a Commission issued on the twenty-fourth day of September, and on the second day of November, 1920, by His Excellency the Right Honourable Sir James Rose-Innes, P.C., K.C.M.G., Officer administering the Government of the Union of South Africa, we, your Commissioners were appointed to investigate and report upon certain matters connected with periodic droughts in the Union of South Africa.

Having completed the investigation in accordance with the terms of reference, your Commissioners have the honour respectfully to submit to your Royal Highness the following report:—

INTRODUCTION TO FINAL REPORT.

A. Your Commissioners had the honour of submitting an Interim Report, in April, 1922, Since then they have continued their work of investigation and collection of evidence. Many more places have been visited; but since it was not deemed necessary to visit and hold meetings in every district, some have of course been passed over. Districts, typical of those parts not previously visited, namely, the South and West coasts of the Cape Province, the Cape Midlands, the Eastern Province and the edges of the Native Territories, Natal and the Western Transvaal were selected and in them meetings were held. It is considered that the evidence heard there reflects fairly the conditions in the areas concerned.

B. Most valuable evidence which bore the hallmark of very careful preparation was submitted by scientists and specialists to whom thanks are due; but your Commissioners regret to record that many persons who, both by training and experience, should have been in a position to assist, failed to do so in spite of repeated requests.

C. Nor can all of these persons be blamed for their lack of interest or refusal to assist. The authorities that directed the Ship of State at the end of the eighteenth century realised the importance of many problems in agriculture and endeavoured in a high-handed and drastic manner to cope with them.* Such methods have become impossible; others, however are still available. For well over half-a-century enlightened citizens of South Africa have warned their fellows of the danger of desiccation hanging over the sub-continent. The overwhelming majority of their countrymen, unfortunately, have persistently turned a deaf ear to those warnings. For over a quarter of a century the governments of the various States of South Africa have applied to experts and commissions for advice as to ways and

* As an example the following may be cited:—During the period that General Jansen was Governor in the Cape an attempt was made to convert the old Cape sheep into woolled sheep by the introduction of merino rams. The control of breeding was placed in the hands of a commission, and the following clauses of the proclamation issued at the time indicate the method employed by the administration to enforce their wishes:—

Art. 20.—Whoever, at date of publication hereof, may be in possession of one or more pure-bred or wool-bearing rams and castrates the same—or whoever may kill or otherwise remove any such rams or ewes, whether pure-bred or already in the fourth stage of cross-breeding, for any palpable reason with the object of thereby hampering the work of the Commission, will render himself liable to a fine of one thousand rix-dollars for each ram castrated or any ewe of Spanish breed, killed or otherwise removed with deliberate intent; *together with confiscation* of all the remaining sheep he possesses in the Colony for the benefit of the funds of the Commission.

Art. 21.—Whoever may be in possession of Spanish or cross-bred Spanish sheep and put to his ewes rams which have not been approved by the Commission shall forfeit, in respect of the first offence, the rams as well as the lambs resulting therefrom, besides one third of his whole flock of sheep. For the second offence, with deliberate intent, the stock-farms of such persons will, in addition to the above-mentioned forfeitures, be withdrawn in order that they may be re-issued to others, and such persons will furthermore be prohibited from keeping any livestock again in the Colony.

Art. 22.—Whoever may begin to convert his sheep into Spanish or woolled sheep without the written consent of the Commission—whoever may for that purpose purchase or receive a ram which has not been approved by or at the instance of the Commission—shall forfeit 10 per cent. of the number of his sheep for the benefit of the funds of the Commission.

Art. 23.—Whoever may receive rams from the Commission for the conversion of his sheep, and at the same time keeps other rams in his flock shall, for the first offence, forfeit one-third of his flock of sheep for the benefit of the Commission as aforesaid; but in the event of the offence being repeated, he shall be dealt with in the manner described in Art. 21 in respect of his farms.

means of stopping or arresting the desiccation. For over a quarter-of-a-century this advice has been pigeonholed. The lack of interest mentioned in the previous paragraph is therefore to some extent justifiable.

D. Meanwhile conditions have been steadily getting worse and to-day the Commission sees the results of inaction on every hand. Frequently, on asking for expert evidence the reply was received that evidence had on previous occasions been given at the request of the State. Then would be put to your Commission a counter question inquiring what had been done to carry out the recommendations of individuals and commissions who had previously been appointed by the State to report on the same problems. Thus many a man, who formerly was anxious to assist, has become callous on account of the failure of previous governments to come to grips with the problem.

E. No evidence laid before your Commission since the publication of its Interim Report has caused it to modify any of the statements or recommendations therein contained. This the Final Report is supplementary and additional to the first. The paragraphs and chapters are therefore numbered to follow on those of the Interim Report, which must be regarded as an integral portion of the Final Report. For this reason the Interim Report, with its appendices, is inserted between these introductory paragraphs and the new chapters.

F. Your Commission has thought fit, in order to keep down the cost of printing, not to include all the evidence submitted. The minutes of meetings, present to a certain extent, a repetition of one another. Conditions with reference to soil-erosion, deterioration of the veld, jackals, and so on, are so common to, and so uniform over, large sections of the Union, that the benefit to be derived from the publication of the minutes would not justify the cost of printing. The subject matter discussed at meetings is fully presented in the Report itself.

G. With reference to written contributions, your Commission has selected some for publication. In making its selections, your Commission has been guided by the desire to present only those essential. They are either typical of their class of evidence—for example coming from one particular profession—or they assist in amplifying points touched on by your Commission, or they indicate the information on which certain recommendations of your Commission are based. In certain of the selections there are many points on which your Commissioners do not agree with the opinions expressed by the contributors.

INTRODUCTION TO INTERIM REPORT.

1. The several matters upon which the Commission has been instructed to report, all deal directly with problems arising out of drought losses.

2. While the recommendations contained in this Interim Report furnish, as far as they go, direct replies to the Terms of Reference, it has, however, been deemed advisable to refer generally to what may be called the "drought-resisting capacity" of the Union because it is necessary to prepare a foundation on which to construct this and subsequent reports. Moreover, the factors responsible for the serious periodic drought losses in the drier parts would seem to be in operation throughout the Union generally.

3. The Commission, in conducting its investigations, decided not to study the past very deeply, as that has frequently been done before. Two points, however, seem firmly established: firstly, that a large portion of South Africa was dry long before the white man arrived, as evidenced by the name "Karoo" and by the highly-specialised drought-resisting flora of that region; and secondly, that since the white man has been in South Africa enormous tracts of country have been entirely or partially denuded of their original vegetation, with the result that rivers, vleis and water-holes described by old travellers have dried up or disappeared.

4. This drying out of extensive areas of the Union is still proceeding with great rapidity in many portions of the country, and in parts now apparently too dry to permit of their growth, tree stumps of indigenous and exotic trees, would seem to corroborate the human evidence to that effect.

5. It is unnecessary for your Commissioners to vie with the several writers who have, at various times, with facile pen depicted the gloomy and ghastly future which lies before our country, if we permit these processes to continue. The simple unadorned truth is sufficiently terrifying without the assistance of rhetoric. *The logical outcome of it all is "The Great South African Desert" uninhabitable by Man.*

6. From figures furnished by the Census Department, it has been estimated, on prices obtaining prior to 1914, that the direct losses of farmers during the 1919 drought amounted to not less than £16,000,000.

7. What the indirect losses were it is impossible to say, but they were obviously considerable, and *affected every profession, business and trade.* The losses that have occurred, say, during the last fifty years from these recurring devastating droughts cannot but lead to the conclusion that the position demands the earnest attention and, if need be, intervention of the State.

8. During the course of its labours the Commission has found the problem of avoiding losses through droughts one of exceeding complexity, requiring a much more extended investigation than was at first realised. To give some idea of the nature and scope of the investigations which your Commissioners decided were necessary in order fully to answer the terms of reference attention is drawn to the circular letter (Appendix "A" of this Report) which was addressed to our universities and other centres of scientific activity.

9. Much ground has still to be covered, but it is felt that a stage has been reached which permits of this Report being made.

10. The kraaling of stock, occasioned mainly by the jackal, inadequacy of the drinking water facilities, the destruction of vegetation and the resulting soil erosion, which in turn leads to a serious diminishing efficiency of the rainfall are the main causes of drought losses. That these are only a portion of the total losses brought about by these factors, is an additional reason for taking measures against them.

11. At the outset it had to be decided whether the commission should go to witnesses or witnesses should come to your Commission. The former alternative was chosen as being calculated to give your Commissioners a clearer conception of the conditions and circumstances obtaining in the various parts of the Union: besides which, it would result in the whole problem becoming better known and understood throughout the land. In this decision the Commission had the approval of the Honourable the Minister for Agriculture of that time who, furthermore, suggested that an educative campaign might be simultaneously conducted. The Commission, therefore, acted in a dual capacity and in its educational work was assisted occasionally by officers of the Department of Agriculture, to whom thanks are due.

12. In notifying time and place of meetings, the Department of Justice (through its Magistrates or Police) and the Department of Posts and Telegraphs (through its Postmasters and Postmistresses), rendered invaluable aid, which is gratefully acknowledged.

13. The course adopted in taking evidence from farmers at public meetings was to request the magistrate, or other prominent citizen, to nominate a number of those present, who would be thoroughly representative of the various parts of the district. These were examined collectively; those not so chosen were given the opportunity to remark upon the replies of the nominated witnesses. On the whole, this plan appears to have worked well; in any case, this method of taking evidence was the only way of dealing with a large number of witnesses in a reasonable time.

14. The map (Appendix "B" of this Report) indicates the districts in which the Commission has already held meetings as well as those which have not yet been visited. In all, one hundred and two public meetings have been held of which Mr. van Reenen attended all; the Chairman, Mr. du Toit, eighty-eight; Mr. Kolbe, sixty-nine; Mr. Gadd, fifty-six; and Mr. Stead, fifty-four. The last two members of your Commission were unfortunately prevented by serious illness from attending a larger number of meetings. Two meetings duly advertised had to be abandoned owing to swollen rivers, and one owing to an epidemic of influenza. Four meetings were indefinitely adjourned owing to insufficient attendance.

15. The Commission held its first meeting early in November, 1920, since when, with the exceptions of an enforced break during the General Election Campaign of 1921, and short breaks to allow members to visit their homes, it has travelled continuously up till December, 1921.

16. During December, 1921, though the courtesy of, and the arrangements made by, the officials of the Basutoland Government, your Commissioners were able to visit the head waters of certain Union Rivers, which have their origin in Basutoland, and study the erosion that is taking place there.

II. RAINFALL.

17. Before passing to the consideration of the factors mentioned in the first Chapter as being responsible for much of the devastation due to droughts, it is necessary to state clearly what is meant by a drought in order to prevent misunderstanding.

18. Ordinarily the word means a want of rain, or dry weather, and is perhaps more often applied to crops than to grazing. In this report the term is used with reference to grazing only, particularly for sheep, amongst which class of stock losses have been severest. In some parts of the world a few weeks of dry weather would constitute drought conditions; while over the greater part of the area with which the Commission's enquiries have dealt, as many rainless months in winter would be perfectly normal. Again, within our own borders drought conditions develop much sooner in grass-covered areas than in the scrub-covered Karroo, where the vegetal covering is highly resistant to drought.

19. The meaning, then, to be attached to the word drought in this report is a period when grazing has become so scarce and the supply of water at the drinking places so diminished that loss of stock results.

20. From a consideration of the meaning of the word drought we naturally turn to the question of rainfall.

21. The Commission has not yet been able to complete its investigations in connection with the rainfall factor in the Drought problem. It is hoped, however, that important recommendations dealing therewith will be submitted when the final report is presented.

22. In the meantime it is necessary to state briefly what the position is. Neglecting the climatic changes of past geological ages, no evidence has been submitted to your Commission to prove that the average annual rainfall in South Africa has changed during recent times. Variations from year to year naturally exist. Good and bad years follow on each other with no apparent regularity; but no general upward or downward tendency in the mean annual rainfall can be traced. Unfortunately the accurate gaugings on which such conclusions must finally be based are, for the greater portion of the Union, of very recent date.

23. In studying rainfall and its effects on vegetation, however, we cannot confine ourselves to a discussion of the total annual fall. The useful effects of the rain of any one year depend not only on its amount, but also on other factors. It may have fallen in innumerable small showers and be absolutely useless, or it may have fallen in a few useful soaking rains, or perhaps the entire precipitation may have occurred during a very few violent and devastating thunderstorms. The rain may have fallen early in the summer or perhaps rather more towards autumn, resulting in each case in an entirely different state of affairs as far as the value of the grazing is concerned.

24. This introduces a point on which your Commissioners have not up to the present, been able to obtain definite proof. Throughout the country there is a very general tendency among farmers to believe not only that the annual fall has diminished, but also that the rain now usually comes later in the season and that the "good old fashioned" gentle soaking rains are much less common than formerly. The Commission does not consider that definite proof of these alterations has been submitted. The belief is based on personal reminiscences which are particularly treacherous when brought to bear on meteorological data. In cases of this nature witnesses are liable to judge by results alone. The rains of last generation, falling on unbroken, under-stocked grazing lands were more lasting in their beneficial results than rains of equal magnitude falling to-day on veld overstocked, tramped out, semi-waterproof, hard-baked by sun and veld fires. Such rains in the olden days were "soaking" rains with long-lasting beneficial results—to-day they are not. The "cloud-burst" is estimated by the layman by the amount of water in the streams. The cloud-burst or heavy thundershower falling on thicklygrassed virgin veld produced only a trickle in the water courses of former days compared with the torrents rushing down the dongas of our eroded sections under similar circumstances to-day. These facts cannot but have influenced the deductions made by witnesses from their personal observations.

25. In view of the foregoing it would not be wise to place too much reliance on evidence of past meteorological conditions where this is based on recollection; and in doing so one does not need to controvert the strong conviction of many witnesses that droughts are now more frequent in occurrence and more devastating in their effect; for it is not so much the actual rainfall as the effect of that rainfall which determines whether or not the season is one of drought. The effect of rainfall is dependent not only on the time and nature of fall; it is profoundly influenced by stock and veld management, temperature and wind conditions. Herein lies the explanation why rainfall records, which take no cognisance of these factors, are frequently at variance with the farmer in the assessment of drought conditions.

26. Whether the character has altered or not, or its quantity diminished, drought losses can be fully explained without presuming a deterioration in the rainfall. Your Commissioners had a vast amount of evidence placed before them from which only one conclusion can be drawn, namely, that the severe losses of the 1919 drought were caused principally by faulty veld and stock management.

27. The usefulness of a particular shower in relation to the vegetation depends almost entirely on the quantity which soaks into the ground.

28. A very light fall will all be evaporated and give neither run-off nor soakage. A very heavy shower precipitating water faster than the ground can absorb it will give a considerable run-off, which will increase with the intensity of the shower. But while it is evident that the usefulness or economic value of a shower depends firstly on its volume and intensity, its utility is also very largely dependent on the nature and slope of the area on which it falls.

29. Your Commissioners are convinced by the evidence submitted that, as a result of conditions created by the white civilisation in South Africa, the power of the surface of the land, as a whole, to hold up and absorb water has been diminished, that the canals by which the water reaches the sea have been multiplied and enlarged, with the result that the rain falling on the sub-continent to-day has a lower economic value than in days past. Herein lies the secret of our "drought losses."

30. The diminished capacity of the country to hold up and utilise the rain which falls has been caused by the deterioration of its protecting vegetal cover and by soil erosion. In subsequent chapters it will be shown how this deterioration has been caused by bad veld management and soil erosion brought about by the same cause.

31. It is thus evident that by improving the methods of farming practised in the country the efficiency of the rainfall may be increased, which, as far as vegetation is concerned, is equivalent to an increased fall.

32. The position may be briefly outlined in the following sentences :—

- (i) No proof was submitted that the mean annual rainfall of the Union has altered appreciably within recent historic times ; nor is it considered likely that such a change has taken place.
- (ii) According to the evidence of many witnesses there has been an alteration in the nature of our rainfall within the last few decades. No measurements have as yet been submitted either supporting or rebutting this statement which is well within the bounds of possibility. There is nothing to show whether this alteration, if it exists, is permanent.
- (iii) While the mean annual rainfall remains constant its economic value has, to a very great extent, been reduced by the alteration in the properties of the surface of the country for which man is responsible. In this reduced utility of rainfall must be sought the secret of our "droughts."
- (iv) In subsequent chapters it will be shown how improved farming methods and conditions will result in increased rainfall efficiency.

III. KRAALING OF STOCK.

33. In the first paragraph of the Terms of Reference, your commissioners were instructed to investigate the possibility of reducing periodic drought losses by changes in methods of farming. As most of the drought losses in the Union are suffered by small-stock farmers, it is necessary to discuss the methods at present practised by them in order to discover whether any such changes can be recommended.

34. The Commission finds that the custom of kraaling or concentrating stock at certain fixed places at night is practised, with some exceptions, by most farmers in South Africa. The exceptions are cases in which sheep are allowed to run free day and night in suitable paddocks, or in parts of the country where no jackals are found.

35. Left to itself the sheep, in the hot weather, grazes during the early morning and late afternoon ; he rests during the heat of the day and sleeps through the night. If he is kraaled this natural order of things is upset ; he is being driven to and from the kraal, or is grazing when it is highly desirable that he should be resting in the protection of whatever shade is available.

36. Naturally, the grazing near the kraal is the first to be finished, the good grazing gradually recedes from the kraal as the winter progresses and, in a prolonged drought when the sheep have become weak as a result of insufficient food, they have further and further to travel to whatever food is available, and, probably, the time occupied in daily journeyings may be so considerable as to leave not enough in which to eat their fill ; the flock is starving while there is still food enough, if only the sheep could get to it.

37. Obviously, this state of affairs could be remedied by the provision of a sufficient number of kraals, suitably located. But, if for no other reasons, owing to the greater risks which kraaled stock run from attack by internal and external parasites, and owing to the depreciated value of wool soiled by dirt collected from kraals, your Commissioners cannot recommend the multiplication of kraals.

38. In place of kraals, wired jackal-proof enclosures, of dimensions large enough to permit of the animals sleeping wide apart, have been recommended ; and there is a good deal to say for them, as they are obviously not nearly so objectionable as kraals. Their use, however, would still necessitate the driving of sheep, the expenses of herding them, and, furthermore, would be no aid whatever in exterminating the jackal.

In certain parts of the country where small stock are kraaled almost exclusively during winter nights for protection against severely cold weather judiciously planted tree or scrub shelters have proved much more satisfactory than the kraaling system. During the hot summer months such shelters afford shade and in some cases also some food for the animals throughout the year

39. Not only does kraaling increase the difficulties of the sheep in obtaining its food but it actually increases the food requirement, and thereby lessens its chances of coming through a drought.

40. The increased food requirements arises in the extra work it has to do in travelling to and from its grazing grounds and, also to a less extent, to the fact that it has to spend more energy in keeping down its body temperature (which it does by evaporating water from lungs and skin) than its more fortunate unkraaled brother who rests throughout the heat of the day. A still more important fact than any yet mentioned is the greater ability of the free ranging sheep to sustain life by drawing on the reserves of fat and flesh of its own body.

41. A sheep in a normal state of health can live several weeks without food, provided it has sufficient water to drink and provided also it is at rest. Presuming, therefore, all the grazing on the farm to have been consumed, the resting sheep (i.e., the free ranging sheep) has still many days to live while his unfortunate driven brother will rapidly sink exhausted by his daily toil long before his body reserves have been fully utilised.

42. But usually the veld will not be entirely depleted of fodder although there may only be a very little. Little though it be, provided only the animal can get it, it will postpone the day when the animal will have called on its body reserves to the utmost limit; obviously the unkraaled animal has the best chance of doing so.

43. It is evident, that at the end of a bad season, the general condition of the free-ranging sheep is better than the sheep which has been kraaled, and if, as frequently happens, the following season is also unfavourable, the former animal goes into it with more reserve strength and an increased chance of coming through.

44. From whatever angle the matter is viewed, it is clear that, in addition to the expense of herding, a considerable financial loss attends the kraaling of sheep even if no deaths occur.

45. It follows from the above, that if the farmer would fight droughts successfully or would get the best return from the grazing his farm produces, he must reduce the movement of his flocks to the lowest extent possible: this he cannot do so long as he follows the system of kraaling sheep.

46. The experience of the small number of South African farmers who, having the jackal under control, have abandoned the kraaling system, proves indisputably that stock losses can be reduced greatly or entirely prevented by the adoption of their system of allowing the stock to run free day and night.

47. The Commission is therefore of the opinion, that the abandonment of the system of kraaling sheep is an essential step in the reduction of drought losses.

The Commission finds that:—

- (1) **The kraaling of small stock, which forces the animal to lead an unnatural life, is the prevalent practice among farmers throughout the Union.**
- (2) **The kraaling system necessitates much driving of stock and an increased food requirement, which is particularly disadvantageous in times of drought.**
- (3) **Driving is detrimental to the condition of the animal and seriously endangers its life when, through the effects of a bad season, it is in a weakened state.**
- (4) **Apart from its action on the sheep during times of drought, kraaling, as a general practice, is at all times detrimental to the health of the animal and the value of its wool.**
- (5) **Experience has shown that the system of running sheep day and night in suitable paddocks is attended by very small drought losses.**
- (6) **The abandonment of the kraaling system is a necessary step in the reduction of drought losses.**

IV. OVERSTOCKING.

48. Another practice prevalent throughout the country among farmers, which has a very important bearing on drought losses, is overstocking.

49. Wherever the Commission went witnesses stated that their farms were overstocked and that they made no special provision for the drought which they knew would overtake them sooner or later.

50. It is a problem of extreme difficulty to decide upon the number of stock a farm can carry from year to year, and this fact furnishes one very good excuse for the overstocking so generally observed.

51. The amount of grazing produced annually by a farm, *other things being equal*, depends on the rainfall. If, therefore, the rainfall and other factors remained constant from year to year, it would be a simple matter to arrive at the stock carrying capacity of any farm.

52. But the rainfall factor varies tremendously from year to year and, furthermore, without any apparent regularity. Therefore, *even other things being equal*, it is impossible for the farmer to estimate the number of stock he should carry, if he depends on veld grazing alone. Besides *other things* are never equal, making his difficulties so much greater. It is no exaggeration to say conditions vary so much that a farm will carry double the number of stock in some seasons that it can in others.

53. Since, up to the present, no means of predicting seasonal variations is available to the farmer, the element of speculation must enter largely into the stocking of farms, unless reserves of fodder are accumulated for bad times, which is seldom the case.

54. If the farmer, in deciding the number of stock he should hold, proceed by the method of average, his estimate for bad seasons, made when the drought is not on him and his outlook is very optimistic, is bound to be high. Thus it is in bad years that the farmer finds himself with more stock than his farm can carry, and he suffers more or less serious loss. It is impossible to blame him for his optimism; but his failure to make provision for the drought is not to his credit.

55. The above is roughly what happens in the ordinary course, when the fluctuating rainfall and the subsequent impossibility of definitely and correctly estimating the available grazing of the coming season, is the reason for overstocking. There are, however, other reasons which have the same effect; high price of wool, an income tax and super tax calculated on the number of sheep sold and not on the value of the increase, a desire to pay off a bond in a short time, the inflated price of land, etc.

56. The position, then, when the 1919 drought came upon the country, was that farms were much overstocked and, excepting a few illuminative cases, there were no special fodder reserves. Added to this, owing to the drought being very widespread over the Union, these farmers whose foresight would have led them to send their stock away, were unable in very many cases to hire grazing. In times like these, when trekking becomes necessary there is always a certain amount of confusion and waste of effort and valuable time on the part of farmers seeking grazing for their stock. Organisation, which would put the man who has grazing available, into ready touch with the farmer who needs it, would be very helpful in reducing drought losses.

57. The result of overstocking, long before it leads to losses by death, is over-grazing, the evils of which are cumulative and apparently, not generally recognised. In order, therefore, to give overstocking a proper perspective, it is necessary closely to examine the effects of over-grazing.

58. Overgrazing compels an increased movement of stock through their having, on the whole, to forage over a greater area to obtain their food requirements: this, like driving to kraal or water, tends to trample out the veld, and demands extra energy and, therefore, an increased amount of food.

59. When a farm is overgrazed continuously, it is plain that not only will the stock go into drought with the handicap of a shortage of food in prospect: they will also be in a poorer condition than if the farm were not overstocked.

60. More important than anything else is the progressive effect of overgrazing on the vegetal covering of the veld. This effect will be fully considered in a subsequent chapter.

Your Commissioners find that:—

- (i) **The practice of overstocking farms is very prevalent throughout the Union.**
- (ii) **Several causes are responsible therefor, among which are extreme seasonal variations and the optimism of the farmer.**
- (iii) **Animals on overstocked farms go into drought handicapped by a low condition, as well as little food in prospect, which circumstances lessen their chance of coming through the drought.**
- (iv) **The reserving of fodder for use in times of scarcity is a very unusual practice.**
- (v) **Overstocking leads to overgrazing and all its attendant evils.**
- (vi) **Largely responsible for drought losses is the almost universal practice of overstocking the farm, and a failure to make any sort of provision for the drought which the farmer knows will come on him sooner or later.**

V. WATER SUPPLY.

61. Farmer witnesses were unanimously of the opinion that one of their greatest difficulties in drought time is to provide sufficient water for their stock; through the limited number of drinking places stock had often to travel long distances to water when in a weakened condition; they believed that an adequate supply of water would often have meant live animals instead of dead ones.

62. The Commission finds itself in full agreement with these witnesses, with this addition, namely, that too little attention is paid to the quality of the water supply, in that very often animals are allowed daily to urinate and defecate in the water they have to drink, rendering it impure. This has the effect of lowering the standard of general health, and with it, the power to withstand the hard conditions which are inseparable from droughts.

63. It is not necessary to enlarge on the driving of stock long distances to water; since, what applies to driving due to the kraaling—and this was fully discussed above—applies equally to excessive movements of stock necessitated by any other cause.

64. It is, however, to be noted that the farmer loses much of the benefit of having abandoned kraaling, if his stock have still long distances to travel to water.

65. Since it is highly desirable that there should be no misunderstanding regarding the supreme importance of an adequate supply of water for stock, it is necessary, briefly to review the principal functions of water in animal life.

66. That an animal can live without food for several weeks is made possible by the reserves of food stored up in its body; but of reserves of water the animal system has none, or next to none. For this reason an animal cannot live many days without water.

67. Every cell of the animal body must contain its quota of water, which has to be maintained against continuous heavy losses in the dung, urine, perspiration and breath. If by

reason of the animal getting too little water to drink, these vital processes rob the cells of the body of more water than they can spare, the blood begins to thicken and the temperature of the animal rises until a state similar to that of fever is produced, with a consequent rapid loss of flesh and ultimate death.

68. Another very important point with reference to water supply is that, as the drought proceeds, the animal's water requirements increase; which is due to the fact that the dry fibrous food available in drought times, requires an increased quantity of water for its digestion and passage through the alimentary canal.

69. Unfortunately at such times the water supply is usually a dwindling quantity. It is no wonder that so many animals die, and that farmers clamour for Government assistance in the search for water in areas where great difficulty is experienced in finding it. It is no wonder that the stock of an area are congregated where there is water to drink, regardless of food supply.

70. Your Commissioners find that :—

Water is the first essential of life and the provision of adequate supplies of it is a prime necessity in fighting droughts; that Government should encourage farmers in every way possible to improve the water resources of the farm, and that improvement in this direction will act very materially in fighting drought.

VI. DETERIORATION OF VEGETAL COVERING.

71. The retention or improvement of the natural vegetal covering of the country is a matter of vital importance to animal life. Obviously the vegetation valuable for grazing forms a portion of the vegetal covering, and its deterioration reduces the available food supply, while the increased run-off of water which follows upon the destruction of the vegetation, decreases the efficiency of the rainfall.

72. It is not proposed to discuss here all the causes which have led, and are still leading, to deterioration of the vegetal cover, but only certain of them, which are intimately connected with small stock grazing.

73. Kraaling and herding of stock, owing to the Jackal, certainly leads to a notable destruction of the vegetal covering in a mechanical way, namely, by trampling it. Several witnesses expressed the opinion that the flocks tramp out more than they eat which, however, is probably overstating a serious position. The most serious damage is done near the kraal where the trampling is most concentrated and, as will be shown later, the continuous concentration of the flocks in the neighbourhood of the kraal leads to a considerable area around it being overgrazed, with disastrous results.

74. The herding of stock also tends to a similar mechanical destruction of the herbage, for herded stock keep much closer together than stock which have a free range.

75. In how far the collection of much of the dung and urine of the animals in the kraal affects the nutrition of the vegetal covering, it is not possible to say; but presumably, it would be best if all the excrement of the animals became available as food for plants on which they fed, as would be the case if the stock were not kraaled.

76. The scarcity of drinking places causes a concentration of stock with similar evil results.

77. Speaking broadly, overgrazing modifies and, in bad cases, destroys the vegetal covering.

78. The chief characteristic of the indigenous covering of an area of low rainfall, or an area where the rain falls at infrequent intervals, is the high proportion of perennials.

79. When a rain has fallen, the perennial plant, with its already well developed root system, is in a position to make the fullest use of it, and is in vigorous growth before the annual has had time to germinate, let alone establish a root system. Thus it happens that the annual has a poor chance of surviving, unless rain falls in such a manner as to keep the soil sufficiently moist to make growth continuous. Supposing the annual makes a start and no more rain falls: it must die, but not so the perennial which, having stored up nutriment in its buds and root stock, goes into a resting condition until the next rain comes.

80. Thus, not only are perennials well fitted to make the best of a scanty rainfall and to survive long intervals between rainy periods; they tend also to repress annual growths and in doing so mask their existence.

81. Suppose in such an area the perennials have been rooted out: the annuals will have a clear field; will have all the rainfall to their own use, will become increasingly prominent; but will still, however, cease growing and will die when the soil dries out, which, it is true, may not happen until considerable growth has been made. It is clear, however, that the yield of fodder by annuals is much more dependent on rain at frequent intervals than is the yield of perennials. That being so, any factor which tends to the replacement of perennials by annuals tends to make the veld less certain of being able to carry its quota of stock throughout the year.

82. The effect of overgrazing is actually to weaken perennials, and thereby increase the hold of annuals, which it does in the following way :—

83. The continued existence of a perennial is only possible so long as it can produce and retain, for a sufficient period, a leaf surface, to manufacture food for storage for the resting period between rains and the period of renewed growth after rain.

84. But, if a perennial be allowed to form leaves which it retains for too short a period, it will cost the plant more in stored food to produce the new growth, than that growth will have enabled it to restore. If this happens without intermission for a sufficient number of times, the food reserves of the perennial will become entirely exhausted and, like the annual, it will die. Something like this happens on overgrazed veld. The perennials spring into edible growth first, and before they have had time to manufacture their reserve food requirements, the hungry animals come along and eat them down. Thus occurs the first weakening which, repeated often enough, kills the plant.

85. Palatability plays an important part in actual practice, with the result that those perennials which the animals like best, are the first to suffer ; while those they do not like at all, become more and more vigorous. Thus, in such of the drier parts of the Union where overstocking has been pronounced, annuals like "steek" grass have become prominent, and "bitter bos" has crowded out almost everything else.

86. What, then, in the neighbourhood of kraals and drinking places, is usually ascribed solely to the trampling effect of animals, has really, to a great extent been caused by overgrazing ; for there, if there be any vegetation at all, it is usually of the undesirable type.

87. The effect of overgrazing on the covering of the veld is modified considerably according to the time it takes place, the most detrimental period being that when growth is very active, as for example, after the drought breaks ; for this rapid growth after plenteous rains determines, not only how much fodder there will be for the coming dry period, but also, and even more important, the amount of storage in rootstock, bud and seed ; and through this, the yield of fodder in the coming year.

88. Thorough grazing subsequent to this period does not seem to matter much, for from America, where important investigations have already been conducted into range management, it is reported that, by reducing the number of stock during the main growing season (about 4 months) to about half the average number the range can carry for the year, and thereafter grazing fully for the remaining eight months, it was found that the range so treated improved as much as similar ranges protected for the whole year.

89. This is most important testimony in favour of dividing farms into small camps so as to allow of proper grazing control ; and it is eloquent corroboration of the evidence of those witnesses who told your Commission how the internal fencing of their farms had so improved their veld as to enable them to carry from 33 per cent. to 75 per cent. more stock. Furthermore, it strongly supports the reserving of fodder for drought times (and for the winter period) for, the better the condition of animals when new growth begins, the less intensively will they graze it.

90. This explanation of overgrazing would not be complete without reference to that valuable Karroo fodder plant, *pentzia virgata*, the "skaap bos" and a method by which it propagates itself, if given the chance. The branchlets of this plant grow over in graceful curves until they touch the ground where they bend suddenly upwards. At this bend roots form under favourable circumstances, and with them an independent plant comes into being. If stock are continually passing over these plants, it is obvious that these branchlets cannot strike root, even if they escape being eaten. Therefore, to maintain a good covering of this valuable fodder plant, the veld must be rested from time to time ; nothing is more calculated to destroy it than overgrazing at the period of active growth.

91. It has been necessary, somewhat fully, to treat of the effects of overstocking, not only to show that the opinions of witnesses regarding the evil of overstocking are well founded ; but also to show that the evil is much deeper seated, and more insidious in its attack than is generally understood ; furthermore, it is only by taking all of the facts outlined above into consideration, that the foundation of a proper system of veld management is obtained, namely, complete grazing control.

92. For a farmer to have complete control of his grazing, means that the farm must be divided into many camps so that, at discretion, stock may be entirely excluded from any given area, or be made intensively to graze others. The reason for exclusion will be apparent ; but perhaps it is necessary to add a few words regarding intensive grazing. If intensive grazing be not practised, stock will confine their choice to the most palatable plants. This will eventually lead to their destruction and the spread of the less palatable growths. With intensive grazing stock are driven by hunger to eat all growths which are not actually distasteful, so that all useful growths get an equal chance when the camp in the course of rotation, is rested. Plants not eaten, or which have become established under such conditions, will early become manifest, and steps can be taken to eradicate them before they spread and crowd out useful growths. It may also be stated that palatability and nutritive quality do not

always go together ; in fact the less palatable growths are often the most nutritious ; an additional reason for compelling stock to eat them.

93. No matter how carefully grazing is handled, numbers of valuable plants are bound to die every year, tending to reduce the density of the vegetal covering. For this reason parts of the veld should, from time to time, be allowed to seed before they are grazed. With the farm divided into camps, it will be an easy matter to arrange this.

94. The Commission is of the opinion that, in order to prevent the deterioration of the vegetal covering of the veld, as well as to improve deteriorated veld, it is very necessary to prevent its trampling by stock and, in particular overgrazing at the period of active growth following the breaking of drought.

95. The deterioration in the vegetal covering which is closely connected with the operations of the small stock farmer in the drier parts of the Union, has been shown to be due mainly to kraaling, scarcity of drinking places and overgrazing.

96. The discussions of veld burning, also an important factor in the case, has been omitted in this report, as sufficient information has not yet been collected, and because veld burning is not practised in those parts of the Union where stock losses are severest.

97. In addition to what may be called the external causes of deterioration, another cause is found in the deterioration itself, so that, where other contributory factors remain unchanged, the deterioration, as it increases, will, within certain limits, proceed with accelerated speed. It has already been pointed out that deterioration, by forcing additional movement of stock, increases both overgrazing and the mechanical damage to the vegetal cover ; it is necessary now to introduce the relation between reduction of vegetal cover, and efficiency of rainfall, in order to show how the reduction of either tends to a reduction of the other.

98. The first and obvious point is accelerated run-off following on a reduction of cover. It is unnecessary here to discuss in detail how this accelerated run-off is caused, as the fact is self-evident. This increased run-off which is attended by a decreased rainfall efficiency is serious to vegetation growing under conditions where the water supply is the limiting factor.

99. As serious as the increased run-off in reducing the rainfall efficiency, is the increased evaporation occurring as a result of deterioration of cover.

100. Rains in the drier parts of the Union give place very suddenly to fine hot weather, so that the evaporation of the rain begins very soon after it has fallen ; often long before it has sunk well into the soil. Now when a soil surface is wet the rate of evaporation from it in hot weather is very considerable, thus a large percentage of the rainfall never becomes available to plant life. The effect of the destruction of the vegetal covering, by giving a greater exposure of the soil surface to the sun, increases the rate of evaporation and, through that, the proportion of the rainfall lost to plant life.

101. Where the extent of the reduction of cover is serious, the loss of moisture due to the increased run-off and evaporation may become so great that the total amount available will be insufficient to support the original vegetation. When such a condition is reached, rapid deterioration results, unless other contributory factors, which man may control, are made more favourable to recovery. This is another argument for improved veld and stock management ; because, the rainfall which becomes available to plant life is the principal factor in the yield of grazing.

102. Your Commissioners find that :—

- (i) **The kraaling and herding of stock leads to a mechanical destruction of the vegetal covering due to trampling.**
- (ii) **The lack of a sufficient number of drinking places gives rise to a similar result.**
- (iii) **Overstocking not only leads to trampling, but also to overgrazing.**
- (iv) **Overgrazing tends to destroy perennial fodder plants and encourages the growths of annuals and plants useless for grazing purposes. In this way the grazing yield of a season is diminished and depends more and more on frequent rains.**
- (v) **The effect of overgrazing is very serious when it occurs during the main growing season.**
- (vi) **The farmer should therefore endeavour to reduce intensive grazing at this period.**
- (vii) **This he can do if his farm is divided into paddocks, for such a sub-division permits of the best possible distribution of the stock over the farm, and allows of absolute rest for paddocks which require it.**
- (viii) **Complete grazing control is the first essential of a system of stock farming that has for its purpose prevention of deterioration of the vegetal covering.**
- (ix) **Animals in poor condition graze more destructively than if in good condition.**
- (x) **Reserves of fodder for use, when grazing is scarce, are very valuable, not only for keeping stock alive, but also for preventing overgrazing at the critical time when vegetative growth is very active.**
- (xi) **Even if no permanent damage is done, overgrazing at the period of active growth seriously diminishes the following yield of fodder.**

- (xii) Deterioration in the vegetal covering of the drier parts of the Union has been brought about mainly through the practices of kraaling, herding and overstocking, together with an insufficient number of drinking places, and overgrazing.

VII. SOIL EROSION.

103. The Report up to the present point has been concerned mainly with an examination of farming methods and conditions in their relation to periodic drought losses, and it will be found, on further examination, that these same factors which lead to drought losses, also cause soil erosion, which will now be discussed.

104. It is necessary, before entering into a discussion as to how the prevention of soil erosion may reduce drought losses, to outline how soil erosion has been brought about, and the damage it is doing.

105. Soil erosion can be separated into two divisions, the erosion of cultivated lands, which is a matter of extreme importance, although, until the present time, little or no investigation of this problem has been made in South Africa, and veld erosion as dealt with under Par. 106. The area thus far covered by the Commission in its investigation has not included any portions in which erosion of cultivated lands is very serious, and for this reason only, and not on account of its being of lesser importance, your Commissioners have decided not to deal with it here.

106. The Commission finds that the soil of South Africa is being eroded rapidly in three ways :—

- (a) Through surface erosion by wind.
- (b) Through surface erosion by water.
- (c) Through donga or sloop formation.

107. The surface erosion is, in a sense, the more dangerous form. It is an insidious evil creeping in unseen like a thief in the night and robbing us of our national wealth. The far-reaching effect of this evil is not yet realised, even by many of our soil conservation enthusiasts.

108. The Commission finds the great and important truth, that *the soil of the Union is a definitely limited and irreplaceable quantity*, is not generally realised. Although more soil is continually being formed, the time taken to produce even so small a quantity as an inch depth of soil, is so long in comparison with the span of human life, that the little formed during a generation may be neglected as far as we are concerned.

109. Since the soil is a definitely limited quantity, we are morally and economically bound to conserve it. It is the greatest national asset, the ultimate source of all food, animal as well as vegetable, the source of all clothing, furniture and a large part of our buildings! Slooping, unlike surface erosion is always visible and more or less evident from its first beginnings as a little uncontrolled stream hurrying on its tortuous course. It is something which can be easily realised and is patent to all. Surface erosion, on the other hand, frequently takes place unseen and in the continual removal, with greater or less speed, of the surface layers, the country is losing the most valuable soil and plant food. No figures are available on which an estimate of the plant food annually lost to the Union may be made, but the loss must be enormous.

110. Wind is similar in its action to water. It is the rich surface soil, which has taken centuries to form from the sub-soil, which is first removed. In certain portions of the Union ploughed land has been bodily removed and piled in huge sand dunes which, in their progressive rolling, suffocate everything in their path, and leave only blackened roots in their wake. But this very visible type of wind erosion causes only a small portion of the total damage inflicted. The carrying capacity of the wind is enormous, and when one compares the number of hours per year, during which a scouring sheet of water is passing over the more arid portions of the Union with the number of hours that a strong dust-bearing wind is blowing over the same area, the relation between wind and water surface erosion becomes more evident.

111. While water can carry the eroded material in only one direction—seawards—wind may carry dust uphill or down dale. And yet ultimately this dust, too, moves in only one direction, for however much it may be tossed about backwards and forwards, the direction of the wind prevailing during the dry season must and does decide the main resultant direction of motion.

112. In addition to this surface erosion, and going on simultaneously therewith, indeed greatly assisted by it, is slooping; that is, the cutting up of the veld by runlets and gulleys which eventually form the deep water courses we know as sloots or dongas. These sloots vary from a few inches to many dozens of feet in depth, depending upon the volume of water passing down them, the nature and depth of soil and sub-soil, the gradient of the original surface, and the presence of dykes of rock or similar controlling factors.

113. The damage done by surface erosion is the removal of valuable surface soil. Slood erosion removes both soil and water. The entire soil formerly covering the area occupied by a slood has been removed to a depth of perhaps dozens of feet. It is true that the sub-surface soil may not be so valuable as that which lies above it, but it acted as a source of plant food, and a reservoir for water.

114. In addition, by the reduction of the level of the water surface in the deepening water-course or slood, the virtual gradient of the surface water on the banks of the slood, during a rain, is greatly increased. This results, in the first instance, in innumerable branch sloods eating their way back from the banks in ever-increasing ramifications and, consequently, in an accelerated surface erosion in the surrounding area. In this manner *all* the surface soil is eventually removed in the vicinity of sloods in many portions of the Union. The resultant bareness produces an increased run-off, that is, a reduction in the quantity of water soaking into the ground. The deep sides of the slood further tend to drain the soil on its banks of the water which has managed to soak in.

115. The increased run-off, which all finds its way into the sloods, enormously increases the power of water to undercut the banks, and transport the large amount of material which has caved in during the dry season.

116. Surface erosion, by causing more rapid accumulation of water, multiplies the number, and increases the size, of existing sloods. This, in its turn as shown above, accelerates surface erosion in the vicinity and, by the removal of valuable soil and water, further increases the devastation and prevents recovery.

117. *The cumulative character of soil erosion, noticeable in all its phases, is its very worst feature and supplies an incontrovertible argument for immediate and prompt action if retrogression is to be arrested.*

118. Water, which should have soaked into the ground to feed plants and replenish the underground supply, is carried to the sea. The Commission has found that while, generally speaking, there was a considerable sinking of the water table or depth of the underground water throughout the area traversed, the water, to a notable extent, recovered its original level during recent wet years, except in those districts where slooding is particularly bad.

119. In cases where the source of the water supply can be traced, the relation between rainfall, soil erosion and depth of ground water is quite clear. Springs which derive their water from a long distance reflect variations in the rainfall only faintly, and with a considerable period of retardation between cause and effect. Local shallow springs are affected almost immediately by local rains, while in all cases it appears that a badly slooded catchment spells a receding average water table, however much it may oscillate in answer to changes in rainfall.

120. The sinking of the water table is an economic loss to the country—a reduction in the value of our assets, in so far that greater energy is needed to bring it to the surface where it can be used, and that the ground water is liable to be less available to crops.

121. These ever increasing sloods must result not only in an increased but also in an accelerated run-off. Owing to the recent date of our river gaugings, this point cannot yet be established by actual measurements, but there can be no doubt in the matter. As a result floods in our rivers may be expected to increase in severity, but decrease in time of flow, while periods of no flow will naturally become proportionately longer.

122. South Africa is, to a large extent, an arid or semi-arid country and needs a great deal of irrigation, if for no other purpose than for the full development of its cattle raising potentialities. One stumbling block in the way of irrigation extension is the irregular flow of our rivers. The high floods necessitate exceptionally costly protective works, and the short floods abnormally large canals to permit of the flow of a sufficiency of water in the short time available. These two points, combined, frequently make irrigation schemes economically impossible. The ever-increasing erosion, by increasing the irregularity of our rivers, is magnifying the difficulty and the production of feeding stuffs is hindered.

123. The remedy usually recommended is to build reservoirs for the purpose of regulating the flow to a certain degree. Unfortunately, recent experience in many parts of South Africa has proved the silt factor to be serious. By reducing the useful life of the reservoir the silt increases the amount of repayments to a sinking fund and thereby the annual cost. More erosion naturally means more silt and, therefore, a higher cost of production of feeding stuffs.

124. While some of the silt carried down our rivers may be beneficially used again, as in the Lower Orange River, where the crops are grown on alluvial soil brought down from the uplands, or as along the Gamtoos River, where the silt of the Groot River rejuvenates the old lands, yet a great portion of the silt finds its way, unused, to the sea. And even the silt which does not find its way to the sea is not always beneficial in its results on vegetation, for in certain cases the very fine silt chokes or suffocates plant growth so that its presence in water renders it unfit for irrigation; while in many other cases, again, coarse material brought down from upper slopes spreads out, fan-like, on reaching gentler slopes and kills off all vegetation except useless weeds, thus reducing the grazing yield of the area.

125. The erosive power of water is enormously increased by concentration and increased velocity, and it is to the factors that bring about concentration and increased velocity that we must look when searching for the causes of soil erosion. Generally speaking, the increased velocity is due to a laying bare of the surface of the country affected; but the actual extent of the soil erosion effected depends on many factors, such, for example, as climate, including the temperature, humidity of the air, as well as annual rainfall and the maximum intensity thereof. The resistance of a given soil to erosion depends also on the physical and, in special cases, on the chemical composition of the soil and the nature of the sub-soil and, naturally, also on the slope of the surface and the amount of run-off reaching it from higher-lying ground. The speed at which soil erodes is also decided, to some extent, by its aspect with reference to the direction of prevailing winds and rain storms. And last but not least a big controlling factor is the amount of vegetable covering by which the soil is protected. For a given climate, soil, aspect and slope, there is a certain minimum of vegetable cover needed to prevent erosion. *When left to herself Nature arranges a state of balance between the various factors, rainfall, run-off, soil, aspect, slope and vegetation suitable to the climate. When Man arrives in the arena and upsets the balance by destruction of the vegetation, trouble must result.*

126. While man has been responsible for much destruction of vegetation in the Union, probably no one class of destruction has affected so large an area as that occasioned by the small stock farmer in the manner detailed in preceding chapters. The wasteful system of veld management, which causes so much deterioration of the vegetal cover, therefore can be seen to be a fruitful cause of soil erosion.

127. Indeed, it is now evident that *the present system of grazing is detrimental to stock, vegetation and soil.*

128. While this is a very unsatisfactory state of affairs from one point of view, it is fortunate that as a result of the interdependence of these factors, one remedy, viz., improved methods of veld management, will simultaneously reduce the evil effects of all.

129. Improved veld management is, therefore, much to be desired, and although in the Terms of Reference your Commission has been instructed to report, mainly on direct stock losses, it is deemed advisable to point out here that, while the loss of stock leaves no permanent after-effect, both deterioration of the veld, through retrogression of the vegetal cover and soil erosion, are far-reaching in their effect, and their results will long be felt.

130. For this reason the adoption of a better system of veld management is as necessary for the welfare of future generations in the Union, as for the saving of the flocks and herds now grazing on our veld.

131. It is convenient here to draw attention to the dependence of other phases of soil erosion upon veld management.

132. Kraaled and herded sheep, for instance, do unnecessary mechanical damage to the soil, just as they do to the vegetation by kicking it loose with their hoofs and thus facilitating wind erosion.

133. Then, again, while your Commissioners do not desire to enter into the whole question of the effects of roads and railways on soil erosion at the present stage, it is well to mention a few points. Roads and railways undoubtedly interfere with the natural flow of the water and, by so doing, bring about a dangerous concentration, yet had the surrounding veld not been despoiled by wasteful farming, the run-off would be less, the concentration by roads and railways less and, therefore, the damage done thereby less. Thus any successful efforts of the State to reduce deterioration of the veld will, *ipso facto*, reduce erosion placed to the debit of roads and railways.

134. With reference to soil erosion, the Commission has found:—

- (i) That soil erosion is extending rapidly over many parts of the Union.
- (ii) That, besides slooting, there is a great deal of surface erosion, both by water and wind, taking place.
- (iii) That the soil of the Union, our most valuable asset, irreplaceable and definitely limited in amount, is being removed in enormous quantities annually.
- (iv) That a great part of this soil and valuable plant food is lost for ever, and while the remainder of the eroded material may do good in some instances, it does much harm in others.
- (v) That great damage is done by the eroded material silting up reservoirs and that soil erosion causes greater irregularity in the flow of our rivers, thereby increasing the cost of irrigation works and the cost of producing feeding stuffs.
- (vi) That soil erosion is causing a marked decrease in the underground water supply of the Union, and thereby increases the difficulty of watering stock.
- (vii) Soil erosion is caused by reduction of the vegetal cover.
- (viii) That soil erosion has a cumulative character which, by virtue of the similarity between its cause and effect, always accelerates its rate of growth, in all except a few favoured portions of the Union.
- (ix) That prompt action is therefore imperative.

- (x) That soil erosion is caused, mainly, by deterioration of the vegetal cover, brought about by incorrect veld management, and that all efforts to improve the latter will have a beneficial result on the former.

VIII. IMPROVEMENT OF FARMING METHODS AND CONDITIONS.

135. Sufficient information has now been submitted to make it perfectly clear that the present system of small stock farming, with its kraaling, herding, overstocking and uncontrolled grazing, is leading to serious damage to both soil and grazing.

136. So important to the country is the abandoning of this system and the general adoption of paddocking and improved system of veld management that the Commission is making a survey of the grazing potentialities of the Union with a view to estimating what would be the increased carrying capacity of the country if paddocking be adopted. The figures are unfortunately not ready for inclusion in this report.

137. Evidence showed that, by the adoption of the principle of free ranging an increase of 75 per cent. of stock was carried on a certain farm without damage to the veld, which, on the contrary, actually improved. Similar evidence was received also from other farmers. There can thus be no doubt as to the success of the proposed system, yet with few exceptions, it has not been adopted generally throughout South Africa. Before discussing recommendations for putting into effect those remedies for drought losses which have been discussed in the foregoing pages, it is advisable to endeavour to ascertain the reasons for the retention of the kraaling system.

138. Your Commissioners find that the present system of small stock farming is being adhered to on account of:—

- (a) The presence of the jackal, which necessitates kraaling.
- (b) The scarcity of natural water supply for the drinking places which must be provided in every camp if paddocking is adopted.
- (c) The want of capital required to erect the necessary jackal proof and other fencing, and to provide water for the paddocks.
- (d) The presence of roads—many of them unnecessary—which make the lay-out of a suitable scheme of paddocking extremely difficult, or indeed impossible.
- (e) Custom and the lack of a full realisation, on the one hand, of the evil results of the veld deterioration and soil erosion caused by present methods and, on the other, of the advantages of the new system.

139. It is evident to the Commission from the evidence and from a study of the conditions in the Union that while certain individuals are fully cognisant of the evil which must result from this effort, they start farming with the set purpose of wringing out the life blood of the farm in order to make a quick profit, the great majority allow their farms to be damaged through a failure to recognise the danger on the one hand or to perceive clearly the causes on the other.

140. Many witnesses most strongly recommended direct legislation, stringently administered, with a view to stopping the various evils which have been presented in this report. It is therefore necessary to give the findings of your Commissioners in this connection, and the discussion will at the same time serve to show the limits of public and private action in the reduction of drought losses.

141. First and foremost the State is bound to prevent such waste of its natural resources, which, if persisted in, can but lead to national suicide; so it should take action in connection with soil erosion as it has done in other directions.

142. The State has already recognised the national importance of river waters and has enacted far-reaching and profound legislation thereon. This principle, carried to its logical conclusion, would seem to demand State control of the factor of run-off. Large problems of this nature are looming in the not very distant future.

143. While the responsibility of the State in this matter is great, the individual also has his responsibilities. The individual has brought about the damage and without his co-operation the damage cannot be repaired.

144. Prevention and sustained vigilance are the watchwords necessary in this work. No State organisation can ever supply the minute watchfulness needed, and can but look to the individual to undertake the work for the good of himself, of his children, and of the State.

145. Although it may be highly desirable to give effect to the recommendations of those witnesses who desire direct legislation, your Commissioners do not consider the time ripe for such action. Education of public opinion is first required and thereafter direct legislation, if necessary.

146. The Commission therefore recommends the organisation of a sustained campaign of propaganda in connection with veld deterioration and soil erosion in order to bring home the dangers thereof to all: failing this, there would seem to be no prospect of any appreciable change for the better.

147. As the result of travelling through the country and coming into close contact with the people, the Commission has come to the conclusion that the Department of Agriculture is not in that close touch with the farming community which is so highly desirable, especially for propaganda purposes.

148. While the reasons for this lack of touch were not investigated fully, it was evident that largely responsible is an insufficient personnel, especially in regard to the Sheep and Wool Division.

149. Farmers complained that there were far too few sheep and wool experts to meet their needs. Since the best returns from sheep farming are only possible when the animals lead a natural life, your Commissioners are of the opinion that the propaganda natural to the calling of the sheep and wool expert is bound to be attended by far-reaching results in the direction of improved veld management and the prevention of soil erosion throughout the Union, provided the number of such experts is adequate.

150. Therefore, in supplying the existing need for more sheep and wool experts, Government would at the same time be doing a good deal in the direction of preventing the spoliation of the veld.

151. Your Commissioners have come to the conclusion that instruction on soil conservation should occupy a place in the curriculum of every educational institution in the country.

152. To the Orange Free State goes the credit of having been the first to introduce the study of soil erosion to the school child, and her sister province, Natal, followed suit a few years later; but the two larger Provinces of the Union have, as yet, made no move in this laudable direction.*

153. The Commission finds that:—

- (i) **The retention of the old wasteful and destructive method of kraaling and herding small stock is due to several reasons, the chief of which is the presence of the jackal.**
- (ii) **Other reasons are scarcity of water, want of capital and the presence of roads.**
- (iii) **Lack of full realization of the advantages and disadvantages of the two methods of small stock farming also plays an important part.**
- (iv) **Educative work is now highly necessary to induce the individual to do his share.**
- (v) **The State has grave responsibilities in preventing the waste of the natural resources; but direct legislation cannot now be recommended.**

IX. INDIGENCY ARISING OUT OF DROUGHT LOSSES.

154. Before coming to the recommendations for the remedying of the evils already discussed, it is necessary to introduce the subject covered by paragraph 3 of the Terms of Reference. The number of indigents drifting from the countryside to the cities appears to be increasing and this very serious state of affairs demands investigation. At the very commencement of this chapter your Commissioners desire to draw attention to the fact that the indigent, or poor white rejected by the land, is only the extreme result of failure.

155. The path of the farmer in South Africa is beset with many obstacles and setbacks which, while they only hamper the progress of the capable, present increasing difficulties to the less capable members of the profession and may utterly break the weakling.

156. Indigency is due, not only to economic reasons, but also to a psychological and physical state, brought about by such causes as unfit parents, inbreeding, underfeeding, disease and climatic conditions. Among other reasons for the failure of farmers to retain possession of their land in South Africa the following may be mentioned:—

- (a) Droughts, hailstorms and untimely frosts.
- (b) Jackals.
- (c) Stock and plant diseases and insect pests working separately or in conjunction with droughts.
- (d) Cataclysms such as war, rebellion, strikes, "slumps," etc.
- (e) Too minute sub-divisions of farms.
- (f) Inflated prices of ground.
- (g) Want of general agricultural education and training.
- (h) Inability to dispose of farm produce at reasonable rates.

157. While the instructions to your Commission, as set out in Section iii of the Terms of Reference, are confined to indigency arising out of drought losses, the nature of the problem is such that it is impossible to separate one small portion of it from the whole interlaced mass of interdependent and simultaneous causes of indigency.

158. Many of these causes work slowly and are not very noticeable until a drought, by making surrounding conditions more severe, brings on a climax.

* Your Commissioners subsequently learned that they were in error so far as the Cape Province is concerned.

159. Your Commissioners are not yet in a position to deal with indigency due to drought losses in its entirety. An endeavour is being made, as a commencement, to trace the movement of the population and thereby to determine, if possible, to what extent drought is the direct cause of indigency. But whatever the results of these investigations may be, one fact must remain, and that fact the Commission wishes to emphasise, namely, the improvement of any of the conditions in connection with the causes enumerated above must result in a reduction of failures at all times, and particularly at times of sudden stress, such as drought periods.

160. Building upon this truth, the Commission very early in its investigations decided that there was urgent necessity for improving the state of affairs as far as the two last causes of indigency, mentioned above are concerned, namely, training and marketing.

161. Increased facilities for marketing would undoubtedly reduce poverty on farms, and where the produce is of a perishable nature, factories for transforming them into non-perishable commodities are desirable.

162. The Commission does not suggest that at the present time the State necessarily should erect factories for, say, condensed milk, or cold storage depots for the preservation of meat; but such things are urgently needed in the Union, and private capital would perhaps be available if the supply of raw material were assured.

163. It is frequently stated that farmers are spoon-fed. Undoubtedly farmers as a class are very prone to leave a great many matters in the hands of the Government. The Government is continually being called upon by the farmer to perform certain duties which are not a true function of the State at all. In many instances this amounts merely to a loan of the State organisation to the farming community by the Government, for the performance of some function which the farmers could have carried out equally well had they been in possession of the necessary *organisation*.

164. If the agricultural producer be properly organised, capital would find easy contact with the farmer, and the establishment of all sorts of factories would be much facilitated. When such a condition is reached, the farming community becomes more self-reliant and the responsibility of the State is decreased. The State organisation is then no longer called upon to carry out extraneous duties, and may be curtailed. Organisation of agriculturists (in the widest sense, including stock farmers) will thus be seen to tend to improved markets, the establishment of factories, to fewer poor whites, to increased revenue and, perhaps to less costly Government.

165. But another factor causing failure on farms which has been mentioned, namely, the want of agricultural education and training, also stands in very close relation to the question of organisation. It has been stated as one of the findings of your Commissioners that the efficiency of the technical staff of the Agricultural Department is hampered by a lack of contact with the farmer, and that the bridging of this gap by a link of some nature is necessary.

166. In the ~~organisation~~ ^{organisation} of the farmer is to be found the necessary link.

167. The ~~Government~~ ^{Government} finds:—

- (i) That the frequent failure of the farmer in South Africa is due to many causes, which so frequently work simultaneously, that it is difficult to separate them. Periods of sudden strain, such as drought or economic cataclysms, accelerate and magnify losses due, in the first place, to other causes.
- (ii) That, if the pressure from any of these causes be reduced, losses due to droughts will also be diminished. The two causes, mainly dealt with in this chapter, are lack of technical advice and lack of suitable markets.
- (iii) That organisation of the farming community will tend to improve the marketing facilities for all sorts of produce, and will form a link between the Department of Agriculture and the farmer, which will be particularly useful in spreading information.
- (iv) That this will result in increased production and fewer failures among the farming profession.

X. RECOMMENDATIONS.

168. If the conclusions arrived at by your Commission are well founded—and it would seem they are indisputably so for they rest on the solid support of practical experience corroborated by scientific analysis—it is obvious that most of the losses that have occurred through drought would have been prevented had the paddock system of veld and stock management generally obtained.

169. Your Commission therefore recommends that the Government should do its utmost to abolish the kraaling system and make it as easy as possible for the farmer to put the paddock system into effect.

170. In order to make this change possible, it will be necessary, as has been shown, to exterminate the jackal, to provide fencing on easy terms and to facilitate the provision of drinking water for stock.

171. It has also been shown that the deterioration of the veld and soil erosion are national dangers, and that the State must assume its responsibilities in connection therewith.

172. In dealing with all these matters and in order, generally to improve farming conditions, organisation of farmers is a first essential.

174. Although your Commissioners throughout the report have pointed out the great and certain advantages attached to the paddock system of stock farming, it is of the opinion that the best results from this system applied to various types of veld, will only be obtained after a thorough investigation into the many problems connected with the grazing of stock.

174. A large amount of evidence was submitted in praise of ensilage, prickly pear, American aloe (Agave) and the "norsdoring," and your Commission has reason to believe that this praise is well founded, but is of the opinion that further information on these matters is needed.

175. The essentials recommended by your Commissioners, as far as the matters of this Report go, are :—

- (i) **The organisation of the farming community.**
- (ii) **The extermination of the jackal.**
- (iii) **The provision of cheap fencing material**
- (iv) **The development of water supply for stock.**
- (v) **The adoption by the State of its responsibilities in the control of soil erosion.**
- (vi) **The investigation by the Agricultural Department of certain grazing and fodder problems.**

176. **The Commission, fully alive to the necessity for present-day strict economy, presents only these recommendations for your earnest consideration because they all deal with those aspects of the drought problem which are cumulative in their character heaping up trouble for the future at an increasing rate, and demand therefore immediate action.**

XI. ORGANISATION OF FARMING COMMUNITY.

177. The organisation of the farming community has been touched on in the chapter dealing with Indigency, and several points were mentioned in approaching the question of organisation as a panacea for the evils of lack of training and insufficient markets. It is through these avenues of thought that the Commission arrived at the consideration of organisation as an aid to the solution of the problems summed up in the Terms of Reference.

178. There are, however, many other arguments in favour of organisation. From the point of view of the Government of the country, for example, organised farmers are easier to deal with as their wants and desires are more easily ascertained. Organised farmers are also more independent and self reliant, and do not fall back on the Government for support and assistance as do unorganised farmers. Some years ago the Western Province Wine Farmers held demonstrations in Cape Town; to-day, now that they are well organised, they ask no assistance from the Government; but by organisation and co-operation they have solved the problem of supply and demand in an elementary and perfectly effective manner, and have kept the price of their produce at a reasonable figure. This action has relieved the Government of much worry. *It is in the interest of the State to have its farmers organised.*

179. The utilization of farmers' organisations in arranging for the required contact between the Department of Agriculture and the farmer, has already been mentioned. Such organisations not only ensure audiences for the specialist on his visits, but when several neighbouring organisations work together, long and useful tours, with a minimum waste of time, may be arranged. This all tends to increase the usefulness of the Department at a reduced cost, and assists in the spreading of that knowledge and experience collected by the specialist at the cost of the State, with the result that losses of all sorts are diminished, and production increased. Even the ordinary meetings of the organisation, by promoting the exchange of ideas among farmers, have a high educative value exclusive of the information imparted by the specialist.

180. The effect of farmer's organisations on the enticing of Capital for the purpose of converting the raw material into manufactured goods has been mentioned. Farmers' organisations also tend to stiffen up local prices, for by the publishing of market reports among their members, the organisation reduces the chances of the "sharp" middleman. They also reduce the opportunity for many kinds of roguery practiced on the farmer, such as the sale of shares in bogus companies dealing with agricultural matters, sale of badly bred animals for stud purposes, etc.

181. Organisation in certain parts of the Union, resulting from propaganda work carried out by the Commission, has been reported successful in staying financial panics, which would have resulted in bankruptcies and poor whites.

182. For all these reasons organisation of the farmers is necessary, and the sooner they are organised the greater the advantage to the State. With the object of achieving all these

benefits and, ultimately, being freed from unnecessary work, the State should do all in its power to bring about organisation.

183. If the matter were left entirely without intervention, all the farmers, throughout the Union, would eventually organise themselves, as some of them already have in certain districts, but the time that would elapse before its consummation is longer than we can afford to wait. The history of our country during the past decade has unfortunately left behind a too well defined political cleavage in the population, and this is a sufficient reason why the local leaders find organisation of the whole farming body so difficult. Generally speaking, the best local men, who could best undertake the organisation, are all men who have taken a leading part in politics on one side or the other, and to-day carry so marked a political atmosphere with them that their political opponents view them with distrust, even in agricultural matters. Organisation, therefore, to have a chance of success, must be undertaken from outside by someone, such as a civil servant, who has no politics, or some other man whose political preferences are unknown.

184. It is unnecessary, in this report, to discuss, at great length, details and methods which should be employed to carry out this organisation. A small staff of bilingual men, with thorough understanding of the South African farmer and agricultural conditions, will be necessary with the assistance, from time to time, of some farmers from another district.

185. The Commission recommends that the Department of Agriculture immediately proceed with the organisation of the farming community.

XII. EXTERMINATION OF THE JACKAL.

186. In the foregoing pages the practice of kraaling and herding stock was shown to be necessary on account of the depredations of the jackal; also, that the abandonment of this system of small stock farming for a system under which the sheep can live a natural life, is the first essential in preventing drought losses, deterioration of the veld and soil erosion.

187. The logical conclusion to these findings is that the jackal (and other carnivora which attack sheep) must be brought under control and, if possible, exterminated.

188. The natural importance of jackal extermination is already recognised by the State in the rewards paid for his destruction, and in the loans which farmers can obtain from the Land Bank for the erection of jackal-proof fences on their boundaries; but your Commissioners are of the opinion that the State should do still more.

189. In this connection the question of increased rewards has been considered. While there is a large body of opinion in favour of increased rewards, which it is said would lead to professional vermin killers, there is also considerable opposition to such increases. The Commission makes no recommendation on this point.

190. According to the evidence placed before your Commissioners it is, however, plain that little permanent success will attend the efforts to destroy the jackal in any district unless he be first pinned down to an area which will permit of his being eradicated rather than driven away.

191. While there is a considerable difference of opinion throughout the country as to the best method by which the jackal can be exterminated, farmers, wherever the Commission went, asked for jackal-proof fencing. Your Commissioners are of the opinion that nothing is more calculated to lead to the ultimate extermination of the jackal, than jackal-proof fencing, the erection of which should be promoted by legislation.

192. While the Commission is of the opinion that the interests of both State and farmer would best be served by making the jackal-proof fencing of farms compulsory throughout the Union, it considers the time is not yet ripe for such a step. *Where, however, in any district, the necessary majority of owners so decides, the Commission recommends that the law, which now applies to ordinary fencing only, should be amended so as to include jackal-proof fencing.*

193. *The Commission also recommends that a law be made which will compel three or more farmers to combine for jackal-proof fencing of the boundary of their block of farms if the owners of, say, two-thirds of the area or block desire to fence the same.*

194. All owners within such an area would be called upon to pay a pro rata share of the cost and maintenance of such fence, and as the owner of a boundary farm in such an area may make use of that fence for purposes more particularly his own, provision should be made for such an eventuality.

195. With regard to hunting clubs, it is felt that the law is not carried out with sufficient stringency with reference to compulsory hunting, and in so far as the law allows trespass in the pursuit of a jackal, it is practically a dead letter. *The Commission recommends that special attention be given to these points, in connection with the legislation proposed in the preceding paragraph.*

196. Since dogs are bound to play an important part in exterminating the jackal within the fenced areas, *the Commission recommends that the Department of Agriculture make the necessary enquiries as to what type or types of dog are best for hunting purposes.*

197. Your Commissioners recognise that there are those who will consider any measure of compulsion with reference to the jackal irksome; but the benefits which will flow to both State and farmer as a result of the extermination of the jackal, far outweigh any inconvenience to which the farmer may be put. To the farmer the extermination of the jackal means large savings in the cost of herding his flocks; more and better wool; a greater freedom from stock disease and attacks by insect pests; greater protection against scab; and an increased capacity of the farm to carry stock.

198. To the State the extermination of the jackal means that the destruction of the vegetal covering of the country and soil erosion will cease, in so far as the kraaling of stock is responsible; that it will be possible to introduce the paddock system of farming, and through that bring about the restoration of the veld which at the present time is in the process of ruination.

199. *In conclusion, your Commissioners desire to again emphasise that the jackal is a dangerous menace to the State.*

200. *Your Commissioners recommend an effective campaign of extermination of the jackal and to this end suggests certain legislative measures in connection with jackal-proof fencing which are above detailed.*

XIII. PROVISION OF CHEAP FENCING MATERIAL.

201. Your Commission has everywhere heard the same request for cheaper fencing material. The price of fencing material and the want of capital is undoubtedly a big obstacle in the adoption of the paddocking which your Commission has endeavoured to emphasise as one of the most important factors in reducing drought losses.

202. If the proposed jackal-proof fencing act is put into effect in the form recommended by the Commission, the State will be bound to grant loans for jackal-proof fencing. But the request for cheap fencing is not confined to the jackal-proof variety; the public desires fencing materials of all sorts at the lowest possible rates, and the Commission wishes to support them in their request.

203. It is unnecessary to reiterate the enormous advantages of fencing and paddocking. Not only will fencing improve the grazing and the stock, and assist in the extermination of the jackal, and reduce surface erosion, but it has the additional advantage, frequently brought to the notice of the Commission, that jackal-proof fencing brings sloop formation very vividly to the notice of the farmer. The sloop which crosses a fence line is at its start, and with every increase in size, a visible and ever-increasing danger to the effectiveness of his jackal-proofing, and he is forced to give it his attention.

204. Your Commissioners place this request of the farming community for fencing material, on easy terms, before you for your very earnest consideration. It is a crying need in the country to-day, and the effect will be beneficial to the land which we have received from our forefathers and predecessors, and must deliver to our children and successors.

205. It is obvious from the third chapter of this report that the provision of shade and shelter by trees in the veld will tend to the improved condition of stock. This provision is usually lacking, and one of the principal reasons which the Commission has been able to deduce from the evidence is the cost of the protecting fences required during the initial stages of growth.

206. For the same reason the more extensive planting of the spineless cactus is retarded.

207. Cheaper fencing material is needed for the encouragement of these two factors in improvement of farming conditions as well as for the protection of sloots from depredations of stock while reclamation is proceeding.

208. The public requests the granting of fencing loans repayable by annual instalments in twelve years at 4 per cent. interest. Your Commissioners place the request before you in its original form and recommends that the most favourable terms possible be granted.

209. **The Commission recommends that fencing loans be granted by the State to farmers on the best terms possible, and that under such loans farmers be permitted to put up both boundary and paddock fences, whether jackal-proof or not, and even to convert an existing stock-proof into a jackal-proof fence; and, generally, to utilize fencing for any purpose calculated to improve the drought-resisting capacity of farms.**

XIV. DEVELOPMENT OF WATER SUPPLY FOR STOCK.

210. The question of water supply has been so fully dealt with in Chapter V. that it is unnecessary further to urge its importance.

211. **The Commission recommends that the State should encourage farmers in every way possible to improve their facilities for watering stock.**

XV. THE STATE AND SOIL CONSERVATION.

212. One of the most important principles, which the Commission recommends, is the adoption by the State of its responsibilities in connection with the control of soil erosion.

213. It must be clearly understood that this does not entail the filling in of dongas by the State ; but merely that the State must take steps to prevent the needless waste of natural resources. Several of these necessary steps have already been described, and a general adoption of the improved methods of farming suggested will reduce soil erosion and slood formation to a minimum.

214. For many years, however, until the desired condition of affairs is reached, soil erosion will continue to produce its evil effects, and must be dealt with.

215. One great fault in the past has been that the necessary work in connection with soil conservation was not placed in the hands of any department of State or official, and there has been no control. The Commission considers that the time has now arrived for the termination of this state of affairs.

216. Innumerable were the requests at the meetings of the Commission for the establishment of a new Department of Reclamation for the control of soil erosion. This is one of the logical conclusions of the adoption of the responsibilities of the State in connection with soil conservation, but in view of the financial position, and the fact that the beginnings must be small, the Commission is not prepared to recommend the establishment of such a department at the present time. The immediate appointment of a competent officer to deal with these matters, however is essential, and the Commission recommends that he be attached to the Department of Agriculture. The consensus of opinion of the farmers giving evidence in those districts, where soil erosion is serious (and they are many), is that the time has arrived for the appointment of an official who can advise them on conservation of soil. The first duty of such an officer would be educative, assisting by lecturing, by writing pamphlets, and by personal visits to farms. Included in his educative campaign would be experiments in controlling erosion on some well organised co-operative scheme based on the past experience of the Department of Agriculture.

217. In addition to the work outlined above such a Reclamation Officer should also act as a control on the works of other Departments. That farmers are feeling the necessity for this is again evidenced in the application on behalf of several farmers to the Commission for the services of an erosion expert, in order to settle a dispute between the landowners and the Railway Board on a matter of soil erosion.

218. The question of the reduction of roads, so as to permit of paddocking, is also a matter which needs attention. The Superintendent of Roads and Local Works of the Orange Free State Province has worked out a scheme for the reduction in the number of roads, and this scheme has met with approval all over the Union. The Reclamation Officer, when appointed, will have to work in this matter in conjunction with the Provincial Authorities.

219. In a previous chapter the discussion of questions of the control of soil erosion on large catchment areas was foreshadowed. This control would naturally also be placed in the hands of the Reclamation Officer.

220. By the supply of trees, needed to stop soil erosion, at nominal rates, and reduction of railway rates on materials desired for the same purpose, the State could encourage these works.

221. The stopping of sloods and the prevention of soil erosion generally are essentially of the nature of a repair or restoration of the farm, and not an "improvement" in the specialised sense of the word. Expenditure on work of this kind is but to the farmer what "depreciation" of furniture or machinery is to the business man, and yet according to the evidence submitted by farmers to your Commissioners, money spent on such works may not for income tax purposes be deducted from the gross income. The Commission considers this absolutely incorrect even from the point of view of business, and strongly recommends that deductions of this nature be permitted. It is remarkable how strong the incentive is to carry out works and incur expenditure which may be deducted from the Income Tax returns, and this psychological phenomenon should be utilised.

222. Suggestions have been made to the effect that loans should be granted by the State to permit of slood arresting but the Commission cannot support this suggestion as a general recommendation. The majority of the conservation works are restoration works and not improvements, they are not usually permanent, and will require a large degree of maintenance and careful watching. It is difficult to see how the State would be justified in advancing money on such security. In exceptional cases where, by the erection of permanent masonry walls, terraced lands are reclaimed from a gutted vlei, the position may be different.

223. There is no doubt that some legislation will later become necessary to define the position between adjoining owners when anti-erosive works are to be constructed. A few problems of this nature have from time to time been submitted to the Commission, but these are not sufficient to base any recommendations on. Up to the present so little work has been

done that cases of conflicting interests are as yet almost unknown. A Reclamation Officer would naturally in his experience meet with many points and, as occasion arose later, the necessary legislation could be enacted. At present none is needed.

224. As a first step your Commission therefore recommends the immediate appointment of a Reclamation Officer who will be attached to the Department of Agriculture and be entrusted with the duties pertaining to State control of Soil Erosion as outlined in this chapter.

XVI. PROPAGANDA AND INVESTIGATION BY THE DEPARTMENT OF AGRICULTURE.

(a) Propaganda :

225. The Commission found that farmers in general were unaware of existing loan facilities for fencing and other purposes, and recommends *that the Department of Agriculture take steps to bring this knowledge to the door of every farmhouse in the country.*

226. The Commission also recommends that a sustained propaganda in favour of a natural life for small stock and against overstocking should be undertaken at once.

(b) Investigation :

227. With regard to overstocking and overgrazing, *the Commission recommends that the many problems connected with the grazing of stock should form the subject of thorough investigation by the Department of Agriculture, for it is only by such investigation that the best methods of management for the various types of veld can be determined.*

228. From this, it is difficult to imagine any work that is of higher importance to the permanent welfare of the Union which, first and foremost, is a stock raising country. Many farmers told the Commission how valuable they had found the prickly pear in times of drought while from information furnished by the Grootfontein School of Agriculture, it would appear that sheep have been kept alive for over 260 days on a diet of prickly pear only.

229. Now, in many of the drier parts of the Union prickly pear is very abundant, yet is not generally used for keeping stock alive in drought times, the reason being that no cheap, simple method of dealing with the formidable spines with which the "leaves" are covered has yet been evolved. *The Commission strongly recommends that the Government should investigate the singeing and other methods which are in use in Mexico and Texas with a view to introducing them into South Africa, for, not only is the prickly pear a source of food but also of water. The sheep mentioned above, for example, drank no water during the time of the experiment and four of them, which were subsequently put on to a diet of prickly pear and lucerne hay, have now been over a year without drinking water, the water requirements of the animals having been fully met by that contained in the prickly pear.*