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NON-SELECTIVE GRAZING AS A MEANS OF VELD RECLAMATION

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The principle of non-selective grazing has never been put to critical test, therefore in presenting my case for it, I shall have to rely on theoretical considerations, on data having an indirect bearing, and on the interpretation of results of experiments made by a few persevering farmers, who found selective grazing methods unsatisfactory.

The first broad principles of grazing management research were laid down by Rowland in 1934. The aim was to give as much rest as possible to the veld, while keeping camp numbers down to the minimum. This meant that camps had to be large, that little concentration of stock was possible and that, if long enough rests were to be given, grazing periods had to be long too. Even where intensification of stocking was tried in sourveld, it was never taken to the point of non-selectivity. Rowland's sourveld system of different sized camps for periods of different growth-rate could have been developed into a non-selective esystem, by dividing the whole area into camps of the size required for the period of most rapid growth. This would have made it rotatable and deferable. It would have involved 32 camps, true, 16 of them to be mown for Winter feed; but it would have become practicable with 16 camps if Winter feed were grown, as it should be in sourveld. This was not done. The Griqualand West farmer's system, reported by me in 1938, of putting 400 sheep into 60-70 morgen camps for a month or less (to deal with vermeerbos), was never taken up experimentally. In other words, the principle of grazing that was adopted favoured selective grazing. Those are the lines along which pasture research is still being conducwhich pasture research is still being conducted, except perhaps in Natal.

The main criterion of success of a grazing system has apparently been the animal weights — if the weights dropped, the system tended to be abandoned without further investigation, even in cases where a good effect on the veld and carrying capacity was noted.

The commonly advocated grazing systems for sweet or mixed veld will at the start produce an improvement, botanically speaking, in veld which was previously under continuous grazing. The rest periods and the reduction in stock numbers usually ensure this. But the farmer often finds that his animals do not do so well as they did under continuous grazing though they may come through droughts in better condition. After five years or so, the veld looks vigorous and well-grown superficially; but if one looks into it one finds that it is patchy, ranging all the way from patches of bare ground to patches of grossly overgrown veld, with only a small fraction of the whole area properly grazed without selection. It has often been my experience that, looking into it still more closely, one finds that the most palatable species, both grasses and bushes, may be hardly more common or more vigorous than they are under light continuous grazing. The reason for these effects is that the concentration of stock into one of two, three or four camps is not sufficient to counteract the effect of the rest periods. Plants which were grazable under continuous grazing because they were kept short and palatable, become ungrazable by small concentrations of stock when they are rested and allowed to grow out. So grazing tends to become more and more concentrated on the most palatable species which do not become unpalatable when rested. This, too, is one reason why stock numbers cannot be much increased. Another reason is that, with so few camps, grazing periods are necessarily too long if adequate rests are to be given and an

economic number of animals maintained. In short, this type of selective grazing cum resting system is, in my opinion, inherently incapable of using the increased growth which results from the resting system. No re-arrangement of grazing periods and rest periods will overcome this defect. When both grazing periods and rest periods are shortened, as in the sourveld quick rotations, the vigour of the veld suffers and the full carrying capacity can still not be realised.

Let me explain the background to my acceptance of the principle of non-selective grazing. I had already observed in the Native areas, where grazing is both so heavy and so continuous as to be non-selective, that parts which had not been reduced to *Cynodon* or dongas were still covered with very short but very dense climax (or sub-climax) grassveld. Twenty years later, this is still true e.g. in the Victoria Fingo Location near Alice. That non-selective grazing is possible also in farming practice was, however, only brought home to me in 1953, when Mr. Nel of "Sunnyside", Beaufort West, put all his 3,000 sheep into two little hill camps of 100 morgen each. The reason for this action was that this was all the dubbeltjie-free veld that he had, so he had made two camps provided them with water and rested them against the day when dubbeltjie would drive him out of the flats. They had become very overgrown, but nevertheless those sheep grazed everything and remained in reasonable condition for nearly six weeks. Mr. Nel said he thought the 1,600 in one camp did better than the 1,400 in the other. This was just an interesting fact which I regarded as being of more importance to pasture research officers than to me, but in it may lie the answer to the old problem of how to graze overgrown veld after a long rest.

Soon after this, Mr. L. H. Trollip of "Compassberg" proposed using the idea to reclaim his *Danthonia*-veld after burning off the bush. Burning had ceased to be farming practice in the Sneeuberg, but an accidental fire had occurred a few years previously. Starting on a grazed-out farm, it had crossed the mountains into a well-rested farm and had produced some very interesting differential effects which set him to thinking and putting two and two together. Such a proposal was of direct interest to me as being a possible means of reclaiming veld, i.e. not merely of vaguely "improving" it, but of restoring it to the condition in which my studies had suggested it must formerly have been.

Mr. Nel's average annual rainfall being 8 inches, the intensity of stocking he had used was two sheep per inch of average annual rainfall per morgen. Mr. Trollip's camps were then so big that with his 18 inch rainfall he could not get beyond half a sheep per inch, but the partial results he got were such as to suggest that the fortuitous figure of "two sheep per inch" might apply here too. It is a useful way of expressing stocking intensity because, maximum flock size being more or less fixed, it relates camp size to rainfall.

Mr. Trollip was not following any formal system but giving the longest rests he could, up to twelve months, to get the maximum regeneration of such plants at *Themeda*, *Ehrharta* and *Digitaria*. Eventually he decided the best plan was to graze as intensively as he could in his big camps for one month and then rest for twelve to fourteen months. After burning, even this sort of semi-intensification enabled him to run between two and three times the number of stock he could run before, and he was still understocked.

In 1959, to keep the grazing system on an orderly footing, I suggested applying the principle of non-selective grazing to existing grazing systems by the use of sub-camps within the camps, combining a quick rotation within the grazing period with the slow rotation of the system over a cycle of years. As Mr. Trollip had no suitable camps, in 1960 I put this sub-camp idea to Mr. L. N. Howell of "Hillside" Springfontein, and he applied it to an already existing 1,200-morgen three-camp unit. The grazing periods were four months and his rainfall 17 inches. He cut each camp into four sub-camps of 100 morgen, raised stock numbers from 900 to 1,400 and started grazing a month in one sub-camp at a time. At this intensity of stocking (nearly one sheep per inch in veld that was not grossly overgrown like Mr. Nel's veld) it became obvious that a month was too long. He then divided the month into two grazing periods of 15 days

each and grazed each sub-camp twice in the four months, with a rest of 45 days in between. Two grazings in Winter, however, were found to be too hard on the sheep, so one was afterwards taken in Late Summer and only one in Winter (see attached chart). This was successful and caused such a rapid improvement in the veld that he was soon running 1,800 sheep on the 1,200 morgen and was ready to try 2,400 in the fourth year, if a two-year drought had not set in. The improvement took two forms: an increase in the amount of *Themeda, Tetrachne, Digitaria* etc. with partial suppression of *Chrysocoma* and *Pentzia* in the grassy parts, and a rapid covering up of bare patches with *Eragrostis chloromelas, Digitaria* and *Themeda.*

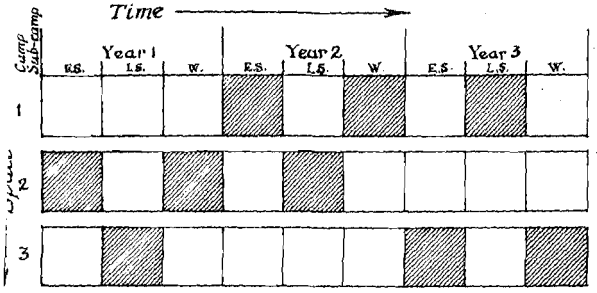
There is no statistical record of this improvement in the veld (apart from the indirect record of the increased carrying capacity), because the thick-spoke wheel was still being used up to 1963. In that year a needle-point survey was made (by Glen) which gave a figure of 12%, as compared with 10% with the thick spoke in 1962. In relation to the diameter of the grass tufts, the true figure in 1962 was probably about 7.5%. Whatever the exact figure may have been, the increase in basal cover, in one year, was convincing, especially as the veld was carrying double the recommended number of sheep.

Mr. Howell's fortuitous sequence of "two weeks on, six weeks off" has since been tested also at "Compassberg". Mr. Trollip had found that his *Themeda* and *Tetrachne,* especially *Themeda,* were very sluggish in recovering after a month's grazing; but having made his camps smaller, in the Spring of 1964 he was able to start with "two weeks on, six weeks off" and got an immediate result. *Themeda* recovered so vigorously that it actually came into seed in the six weeks after the first grazing. This camp is at an altitude of about 6,500 feet on the slopes of the "Compassberg". We had begun to think that conditions must be too cold for *Themeda,* but evidently this was not so. The trouble was too-long grazing periods.

The reason for the success of the "two weeks on, six weeks off" grazing system in reclaiming veld becomes clear when one considers the findings of Sullivan and Sprague in their study of changes in root reserves of grass after defoliation. If replenishment of root-reserves by re-growth only starts three weesk after defoliation, it becomes obvious why grazing or mowing at intervals of one to four weeks should weaken and reduce the root systems and eventually kill the plants. The importance of reducing to a minimum the number of times the re-growth is removed during a grazing period, by keeping the grazing period short, is also obvious. In the reclamation stage, when the palatable climax species like *Themeda* are scarce, light stocking will defoliate these species just as thoroughly as will intensive stocking. So intensive stocking will be to their benefit because it will reduce the competition offered by the less palatable plants like *Danthonia,* which would have received no check at all if the stocking had been light. In this way the grazing pressure can be distributed over not only the scarce but palatable climax species but also the common but less palatable species. This will obviously not be so good for the animals, though equally obviously it will mean that a lot more can be maintained; but as the proportion of palatable species increases so will things become progressively easier for the animals. In this early reclamation stage supplementary feeding will have to be considered. The two-week grazing period is accepted as being about the practicable minimum for a farmer making a start with reclamation. One week would be better for both veld and animals, but would require too alarming a number of very small camps.

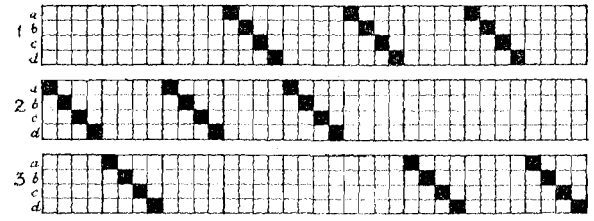
The grass at "Hillside" has retained its vigour through three good years and two drought years under this system, so it seems clear to me that what is true of Sullivan and Sprague's pot-plants is equally true of South African veld under conditions of non-selective grazing. Those two droughty years were genuine droughts. After good rains in November, 1963, the drought started with 0.42 inch in December, and a total rainfall of 7 inches in 1964 with a single good growing season rain of 1½ inches in October. In 1965, the total rainfall through the Summer to the end of March was 2 inches! Yet when I was there in March the veld was full of *Themeda* seedlings and the

The Development of the Howell Non-selective Reclamation System

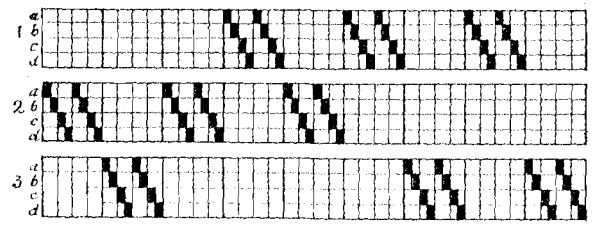


1. The original three-camp system: three camps on 1200 morgen grazed for four months at a time. It carried 900 sheep, reduced to 500 or 600 in dry years. Wool production was never more than 7 lbs. per morgen.

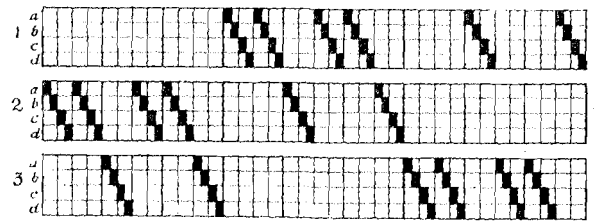
1. The average annual rainfall is nearly 17", mainly in Summer from October to March. Frosts start in April as a rule. On this farm the growing season is reckoned to start on the 15th August, so the grazing (and resting) year is taken to begin on that date. In other parts of the country it might start at another time eg. in the Karroo at Graaff Reinet it starts on the 1st April.



2. Acocks' proposal in 1960 of a quick rotation through four sub-camps per camp. The grazing period of one month, however, is still too long for both the animals and the palatable plants.

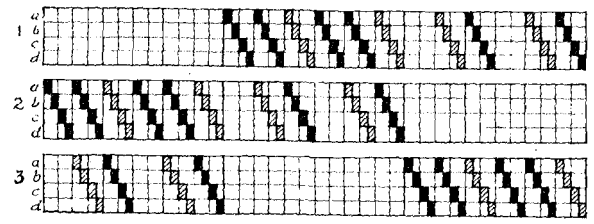


3. As adapted by Mr. L.N. Howell of "Hillside", Springfontein, and started in August, 1960: the month divided into two 15-day grazing periods giving two rotations and two 45-day rest periods in the four-month grazing period of the system. 1400 merino hoggets were used to start with, increasing to 1800. In three years wool production rose to 15½ lbs. per morgen.



4. Early modification to make Winter grazing easier through shifting the second double grazing away from a time when no growth is taking place. This can be done by taking advantage of the flexibility offered by the two-month grazing–resting cycle to break away from the rigid three-camp system, while retaining long rest periods. In the fourth year, cattle equal to 400 sheep were added after the good rains of Oct. & Nov. 1963. They were carried through the drought Late Summer of 1964. Wool production was 15 lbs. per morgen. Numbers were then reduced but never fell below 765 sheep even in the drought Late Summer of 1965. Wool production was nearly 12 lbs. per morgen.

Total rainfall for 1964 was 8·3", of which 3" fell in Winter and only 1·2" in January to March. There was a single good growing season rain of 2·1" in three showers in Oct. The total rainfall for 1965 was 10–11", of which 1·5" fell in Winter and 4·6" in April. As April & May were unusually mild, this rain helped but could not compensate for a total of only 2·5" in January to March.



5. Light grazings that could be taken later on without breaking the "15 day on, 45 day off" rule. These grazings could be taken towards adapting the system for breeding stock. As reclamation nears completion, the longer rests for seeding become less necessary and the 12-months' rest can be deferred to the seventh year.

John P. M. Acocks
25/1/1966

1,200-morgen unit was still carrying 765 sheep as compared with the 900 it could carry in good years under selective grazing. Now that the same effect has been observed in the different veld of "Compassberg" as soon as the system is applied, it cannot be said that it is only true because of some peculiarity of the "Hillside" veld. That stock numbers had to be reduced in the second year of drought points to the need for provision of supplementary feed in such extreme cases.

Because of this vigour of the veld, it is probable that when reclamation is complete it will not be necessary to base the grazing system on a three-camp system giving frequent three- and four-month rests and a twelve-month's rest every third year. Until then, however, these frequent longer rests are of the utmost importance in giving the maximum opportunity for seeding and multiplying to the relicts of those palatable climax species which had been most nearly grazed out. There is no doubt that in many places a plan will have to be made to re-sow these species. They need to be spaced not more than six to ten feet apart if a satisfactorily quick result is to be obtained. Although, as the Howells used to say, there are still a million things, or as they say now, *there are so many things we don't know* about non-selective grazing which experience with selective grazing cannot tell us, nevertheless the practicability and effectiveness of the non-selective reclamation system are no longer in doubt. The most urgent need for research, therefore, has shifted to the problem of how to re-establish the climax species in the veld and how to build up a supply of seed.

My authorities are Pasture Research Progress Reports 1, 2 and 3 and other publications of the Pasture Research Section, and Thornton's "Root Systems of Pasture Grasses". For the rest I have used my own knowledge of the veld and of what is going on at "Compassberg", "Hillside" and many other farms and research stations. A full report of the experiments made at "Hillside" will in due course be published by the Howells themselves, the unit experiment in which I am most interested being only one of many.

To sum up the requirements and problems of veld reclamation by means of non-selective grazing in the pastoral regions where cultivation is not a factor:

(1) Where necessary, the climax species must be re-sown to give a sprinkling of plants spaced not more than six to ten feet apart. One will get an idea of whether this is necessary at the end of the twelve-month's rest which is an essential preliminary to intensification of stocking.

(2) Stocking must be intensive enough to result in non-selective grazing within two weeks. Generally speaking, one sheep-equivalent per inch of average annual rainfall per morgen will be a good starting point. Where there is much unpalatable but grazable vegetation, more may be needed; where veld is very sparse, less. Camps must be small enough to make this intensity of stocking feasible. The idea is to transfer much of the grazing pressure from the palatable climax species to the less palatable species.

(3) Grazing periods must be so short as to reduce to a minimum the weakening of the root systems of the palatable climax species by repeated defoliation. Two weeks is about the practicable minimum, though one week would be better for the animals as well as the veld.

(4) The minimum rest period must be at least long enough to enable re-growth. This minimum is six weeks. Longer rest periods are necessary as well for vigorous seeding and establishment of seedlings of the climax species, though the need for them will become less after reclamation is complete.

(5) The system developed by the Howells, originally based on a three-camp system, has worked so well in reclaiming the veld that it can be taken as the standard system to start with. Twelve small camps are needed, the size being determined by maximum practicable size of flock or herd in relation to average rainfall. Where cattle can be run as well as sheep, camps do not need to be so small as when only sheep or only cattle can be run.

(6) The transfer of grazing pressure from the most palatable to the less palatable plants is hard on the animals. Experiments should be made with supplementary feeding to ensure good condition of the animals during the early reclamation stage.

(7) For the same reason, reclamation should be regarded as an object in itself and done with dry stock whose requirements are constant and which can be run in large flocks and herds of constant numbers. The fluctuating size and number of flocks and herds of breeding stock make it impossible to meet the requirements of reclamation. What this will amount to in practice is this: The farm will be reclaimed, with dry stock, one reclamation unit at a time, which, if ways and means of reseeding can be found, should in all cases take only three to six years. On the remainder, one will do one's best with the breeding stock to fulfil the requirements of reclamation, chiefly by observing the rules that grazing periods must not be longer than two weeks and rest periods not shorter than six weeks. This will safeguard the palatable species even though non-selective grazing to control the less palatable plants will not be possible. When two units have been reclaimed, one can alternate selective grazing by the breeding stock, for their benefit, with non-selective grazing by the dry stock, for the benefit of the veld. This can be done in various ways.

(8) In veld which has been invaded by shrubs like renosterbos, burning at the right time is necessary to remove the competition offered by them and to stimulate germination of seed of such plants as *Themeda*. Chopping out the bush is not the answer because it is too expensive, the bush comes back from seed, it may result in the destruction of the last relicts of the climax species that were hiding under them, and it gives no answer to the problem of tussock grasses like *Danthonia* and *Pentaschistis*.

(9) In such shrubby tussock veld, erosion goes on already between the tufts, but it will inevitably be accelerated by burning, so everything must be done to encourage rapid development of a grass sward e.g. by preliminary resting, by re-seeding and by burning only when the soil is wet and the weather warm enough to allow the grass to grow quickly. In the Summer rainfall area this will be in Spring, while in the Winter rainfall area it will be in Autumn. If conditions are unsuitable, burning must be postponed for one or more years until conditions are suitable.

(10) Soft plants like Spekboom are still a worry where they are scarce. Goats may kill them by eating the bark off their trunks, though if this were to occur the answer would be that the few old "trees" will be replaced by a lot of bushy young plants. Poisonous plants have not so far given any trouble, perhaps because the veld can never be grazed into the ground in two weeks and because under intensive stocking there may not be enough to go round in harmful quantities. They are still a worry. Some of them, like tulp and *Senecio*, will eventually be suppressed as the grass cover becomes denser, but that will not happen for quite a number of years.

(11) Droughts become less of a problem. The concentration of the animals in small areas for short periods has two effects: first, there is a very large reserve of grazing left from the last good rains, enough for almost a year and requiring only minor supplementation; and second, whatever rain does fall during the drought can be fully used by nearly the whole farm, at once, because, the plants being vigorous, they do not have to mark time while they recover. Only the sub-camps which are being grazed at the time when the soil is becoming too dry for further growth will have to wait for the next rain.

Whatever difficulties may arise, if the principle of grazing is right the veld can only improve and cannot deteriorate.

OPSOMMING

NIE-SELEKTIEWE BEWEIDING AS 'N MIDDEL VAN VELDHERWINNING

Die wisselweiding stelsels wat vandag aanbeveel is kan nie die verbeterde veld benutting wat die russtelsels produseer nie, omdat die beweidingsintensiteit in twee, drie of vier kampe te lig is, met die gevolg dat selektiewe beweiding plaasvind. Wanneer die kampe so min is, moet die weiperiodes noodsaaklik lank wees om 'n ekonomiese drakrag te kry as rusperiodes, wat lang genoeg is om doeltreffend te wees, gegee is. Wanneer beide weiperiodes en rusperiodes kort is, soos in die vier-kamp stelsels vir suurveld, word die veld swak en die volle drakrag kan ook nie behaal word nie.

Vir verskeie redes het die skrywer in 1959 die voorstel gemaak dat, om die nodige intensiteit van beweiding te kry om selektiewe beweiding uit te skakel, die kampe van 'n weidingstelsel in sub-kampe gesny moet word. Die weidingsnavorsingbeampte het geen belang daarin gestel nie, maar mnr. L. N. Howell van „Hillside", Springfontein het in Augustus, 1960 (dit was werklik in 1961—in 1960 het hy preliminêre toetse gemaak) die idee aan 'n 1,200-morg drie-kamp drie-seisoen eenheid toegepas. Elke kamp is in vier sub-kampe gesny en elke sub-kamp met 1,400 skape (in plaas van die 900 wat die drakrag van die drie-kamp stelsel was) vir 15 dae in rotasie bewei. Die weiperiode is vier maande, dus kan hy 'n tweede maal, na 'n ruperiode van 45 dae, bewei. Hy het gevind dat hy een van die Winter beweidings in Laatsomer moet vat, en dan het hierdie intensiewe stelsel so 'n goeie effek op die veld gehad dat die veegetalle vinnig tot 1,800 skape gestyg het en in die vierdie jaar (dit was werklik in die derde jaar) was hy bereid om 2,400 te gebruik as 'n tweejaarse droogte nie begin het nie.

Verskeie redes vir die sukses van hierdie „twee weke op, ses weke af" stelsel is gegee en die effek gedurende die droogte beskrywe.

Die benodigdhede en probleme van veldherwinning deur nie-selektiewe beweiding is kortliks :

(1) Waar nodig, moet die klimakssoorte hersaai word.

(2) Beweidingsintensiteit moet swaar genoeg wees om die veld binne twee weke nie-selektief af te vreet. Aanvanklik sal dit gewoonlik om en by een skaap-eenheid per duim gemiddelde jaarlikse reënval per morg wees.

(3) Weiperiodes moet so kort wees dat dit wortelstelsels van die smaaklike gewasse hoe min moontlik verswak word. Twee weke is omtrent die praktiese minimum, maar een week sal beter vir beide die vee en die veld wees.

(4) Die minimum rusperiode moet lank genoeg wees om die smaaklike gewasse die kans te gee om die wortelstelsels weer te voed. Langer rusperiodes is ook nodig vir maksimum produksie van saad.

(5) Die Howell-stelsel is so doeltreffend dat dit as die standaard beskou kan word.

(6) Metodes van byvoeding moet ondersoek word om die vee gedurende herwinning die minderwaardige gewasse, wat oorgebly het van selektiewe beweiding, te help benuttig.

(7) Vir dieselfde rede behoort herwinning aanvanklik met droë vee gedoen te word.

(8) Veld wat deur sulke struike as renosterbos ingeneem is, op die regte tyd gebrand moet word. Uitkap is nie so doeltreffend nie.

(9) Brand veroorsaak meer verspoeling as wat al in sulke veld plaasvind, dus moet alles nodig gedoen word om 'n grasbedekking so gou moontlik te vestig.

(10) Dit was gevrees dat sybokke sal sagte gewasse soos Spekboom beskadig deur die bas af te vreet, maar dit is laer uitgevind dat in twee weke gebeur dit nie. Giftige plante het nog nie moeilikheid veroorsaak nie.

(11) Vir verskeie redes word dit makliker om deur droogtes te kom.