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EDITORIAL.

Contributions and correspondence regarding subjects affecting the farming industry of Southern Rhodesia are invited. All communications regarding these matters and advertisements should be addressed to:—The Editor, Department of Agriculture, Salisbury.

Export of Chilled Beef from the Union.—During the last two months several small shipments of chilled beef have been sent by the Imperial Cold Storage from Capetown to Smithfield with satisfactory results.

On the whole the meat has met with an excellent reception, and though critics are not unanimous in their praises, their criticisms have been considerably less severe than was expected.

The cattle sent do not represent any "super prime" sample, and came either from Departmental sources at Pretoria or from Bechuanaland. The beef realised from 4¼d. to 4½d. sterling per lb. for sides, which is equivalent to about 5.33d. Union currency. These prices averaged about ½d. per lb. below those paid for ordinary Argentine chilled beef at the time of sale.

The expenses of shipment (including slaughter, freight, marketing, etc.) came to 1.16d. per lb. Union currency from

Capetown and 1.37d. Union currency from Johannesburg. From these expenses should be deducted a credit for offal of 0.34d. per lb. in Capetown and 0.25d. per lb. in Johannesburg. The nett return to the producer in Union currency was approximately 21s. per 100 lbs. dead weight in Capetown and 18s. 6d. in Johannesburg.

The condition of the meat was excellent, but it was faulted severely on account of the butchering, which, though an improvement was shown in later consignments, was not up to Smithfield standard. The cattle were criticised on account of age—resulting in "staginess"—and lack of quality, but on the whole were considered suitable for the market.

The shipments are considered by the Union Department of Agriculture to be an unqualified success, and it is hoped that they will prove the precursors of a regular trade in chilled beef.

These reports should be of great value to Rhodesian cattlemen. Similar if not better cattle are available in Southern Rhodesia, and though the cost figures are not directly applicable to this Colony, when allowance is made for the heavier freight charges, etc., from this Colony to Great Britain, the final results on a sterling basis would probably be rather similar for cattle slaughtered in Bulawayo.

The detailed costs of the first shipment of frozen beef from this Colony through Beira, which should be available shortly, will be of great interest for comparative purposes.

World's Grain Exhibition: Canada.—24th July to 5th August, 1933, are the new dates set for the World's Grain Exhibition and Conference, to be held at Regina, Canada. This Exhibition is open to world-wide competition, and any grower in any part of the world may be an exhibitor.

A class of particular interest to Rhodesian growers is the 10 Ears of Dent Maize. The awards in this class range from 1,500 dollars first prize, 1,000 dollars second prize, 650 dollars third prize to 25 dollars fifth prize. Up to date over 40 countries, provinces and states have declared their intention to take some part in the World's Grain Show. Approxi-

mately 200 exhibits for the competitive classes are assured from Australia, and the prospects are that this number will be materially increased.

It is sincerely hoped that our prominent maize growers will seize this golden opportunity of advertising their maize and obtain an outlet for their pedigree seed, and also represent this Colony at the World's Grain Show. All entries must be in the hands of the Secretary of the Show on or before the 1st March, 1933.

Arrangements have been made by this Department to receive and take charge of any exhibits entered by growers in Southern Rhodesia.

The entrance fee in the 10 ear dent class is five dollars or its equivalent in other currency plus transportation charges.

Tsetse Fly: Eastern Border.—For many years a number of farms on the Eastern Border have suffered losses of stock from trypanosomiasis. These losses have increased considerably during the past few years, several farms have been evacuated and the development of one of the finest districts in Rhodesia has in consequence been greatly retarded.

The problem has been investigated by members of the Entomological Branch on several occasions, and a very comprehensive report was received some years ago from Mr. C. F. M. Swynnerton, now Director of Tsetse Research in Tanganyika Territory, whose knowledge of the district and its flora and fauna is probably unexcelled. For many years it was considered that little could be done in Rhodesian territory to alleviate the position. The main "fly" belt is situated across the border in Portuguese Territory. This portion of the International Border runs along an elevated crest of land ranging in altitude from approximately 6,000 feet at Melsetter to 3,500 feet at Mount Selinda. On the eastern side the land falls away sharply, very much in the nature of an escarpment, into Portuguese East Africa, with an altitude of roughly 1,500 feet. A number of rivers penetrate the border, notably the Lusitu River, the Buzi River and the Umselezwe River, their courses lying in deep and

usually well-wooded valleys forming a more or less well defined forest connection with the "fly"-infested forest of Portuguese East Africa. Much of the elevated border consists of open grass land with some open forest and isolated patches of denser forest along the streams. Occasional patches of high type rain forest occur on some of the hills. Within recent years a natural increase in the forest has been noticed, due possibly to the combined effects of under-grazing and protection from veld fires.

Two species of tsetse flies are known to exist in Portuguese Territory close to our border, viz., *Glossina brevipalpis*, crepuscular in habit and restricted in range to a close forest giving much shade, and *Glossina pallidipes*, a thicket-loving fly, but much less restricted in its range of forest types than *brevipalpis*. Both these flies are carriers of the trypanosomes which cause animal trypanosomiasis or "nagana" in domestic stock. A third species of tsetse fly, *G. morsitans*, the species which occurs in the main "fly" belts in Southern Rhodesia, is known to occur east of the Sitatonga Hills in Portuguese East Africa, but its presence near our border has not been confirmed. The first two mentioned flies possibly require a more humid environment, or an atmosphere with a lower degree of saturation deficiency than does *morsitans*, which is a savannah forest fly and highly zerophytic.

Climatically, the Eastern Border with its high rainfall and mist-belt characteristics is possibly unsuited to *morsitans*, but the conditions along the low-lying valleys within our border are in many respects typical of the conditions, both climatical and ecological, which occur in the main "fly" belts in Portuguese East Africa.

Although the losses from trypanosomiasis on many of these border farms have been severe, only one tsetse fly (*G. pallidipes*) has ever been taken on the Rhodesian side of the border. This fly was caught on his horse by the local cattle inspector on Mount Selinda within a mile of the border.

It is probable that natural cyclical transmission of the disease by ranging tsetse flies occurs fairly frequently, although the flies have not been seen. Mechanical transmission of the disease from an infected animal to a healthy one by other species of biting flies may also occur. Under

the favourable climatic conditions which prevail, this latter mode of infection may take place comparatively frequently, in view of the methods of herding employed and of the large number of biting flies that exist in this district at certain seasons of the year.

Evidence proving conclusively that tsetse flies do range into Southern Rhodesia along the natural forest connections with Portuguese East Africa does not exist. It is reasonable, however, to assume that they do, investigations in other parts of Africa having shown that *pallidipes* is a wide ranging species.

To what extent pedestrian traffic or wandering game may be an additional complicating factor is not known, though small herds of buffalo are fairly frequent visitors to some of the border farms.

Forest Clearings, Melsetter Border.—As a result of a recent investigation undertaken by the Chief Entomologist and the Senior Forest Officer in this area, certain localised experimental forest clearings have been authorised. Two areas are to be cleared of forest, one approximately 250 acres in extent, on the Buzi River, intended to break the forest connection in the Buzi Valley with the forest in Portuguese East Africa, and the other, an area of about 200 acres on the Chibudzana River, a tributory of the Buzi River, necessitated owing to a continuous bush connection across Bayswater Farm with Portuguese East Africa. In both cases about 1½ miles of bush in the river valleys will be cleared. Certain small subsidiary clearings will also be undertaken. Complete clearing of the forest on all the farms where trypanosomiasis has occurred is not contemplated, primarily on the score of expense, and, secondly, on the assumption that if the forest connection is broken the free ranging of tsetse flies into Rhodesia will be stopped. Naturally any additional clearing which individual owners might undertake at their own expense would assist in rendering their farms unsuitable for the "fly," and would, therefore, be an additional safeguard for their stock. Such clearings have, in fact, been recommended by this Department for many years.

Considerable information exists both from local experience and from the work being carried out in Tanganyika Territory and Nigeria as to the cheapest and most effective form of clearing to undertake. In the present experimental clearings the bush will be felled and piled around the stumps. Later in the year, as soon as the felled timber is dry enough, the cleared area will be burnt. This method, it is anticipated, will kill most species of trees which occur in the area. Some species of indigenous forest trees are, however, extremely difficult to kill in this way, and a certain amount of coppicing from root suckers is almost inevitable. It is hoped that by judiciously timed regular burning this annual growth can be kept down. A fairly large native population resides in the areas to be cleared, or can be induced to occupy them, and their presence will assist in maintaining the clearings. For the present, the cleared areas will not be fenced, but the grazing of stock will be regulated.

For various reasons it is not considered that permanent "fly" has as yet become established in this portion of Southern Rhodesia. Even though these clearings, designed primarily to protect the farms lying in the area drained by the Buzi River and its tributaries, are of an experimental nature, the result is looked forward to with some confidence.

A careful reconnaissance of the tsetse fly position along the eastern border will be undertaken concurrently with these clearing operations. These investigations should throw some light upon the prevalence of "fly" and the species of "fly" occurring in Portuguese territory close to the border and may indicate other unsuspected channels along which "fly" may range into Southern Rhodesia.

A general census of the cattle on the affected farms is also being taken in order to keep a check on the incidence of the disease.

African Aloes.—About eighteen months ago we were fortunate in securing a series of articles on "Making a Garden in Southern Rhodesia" by Mrs. E. M. V. Carnegie. These were later assembled into a reprint, which has met a large demand. We are pleased to be able to supplement

this series by "Notes on African Aloes," by Mr. H. Basil Christian, the first part of which appears in this issue.

As is generally known, the aloes are, with the exception of possibly one species found in China, entirely African, and probably eighty per cent. of the total number of different kinds are found in South Africa.

In this Colony some fifteen to twenty species probably occur, and it is quite possible that some of them are still in the category known as new species, i.e., undescribed and unnamed. We believe the most complete private collection of African aloes in existence is that of Mr. Christian, and it is owing to the rapidly increasing interest which is being taken in the interesting and fascinating hobby of collecting and growing African aloes and other succulent plants that he has undertaken to provide this series of notes and illustrations of the more common varieties.

Empire Marketing Board Report, 1932.—The change which has taken place in the buying habits of the British public and the growth of the demand for Empire goods are clearly brought out in the Annual Report of the Empire Marketing Board recently published. For twenty-five Empire products new records in quantities of imports have been established, and for more than half of these the record now surpassed was made in the previous year. There is an upward tendency at work in spite of the diminished buying power of the public.

Scientific Research.—As in previous years the bulk of the Board's income has been devoted to scientific research. Some 70 out of the 100 pages of the Report describe the immensely varied field of research which the Board's funds have helped to irrigate. The Imperial Conference of 1930 urged the value of joint programmes of scientific work which should be agreed upon between the various Empire countries so that effort and expense might be concentrated and economised. Acting upon this suggestion, the Board has initiated an interchange of views on what problems of economic importance to the Empire most urgently need the further application of scientific research.

It has been the Board's practice, since the foundation in 1926, to make grants for a term of years to existing institutions in conjunction with other bodies. This method has worked admirably, but it makes discontinuance difficult. To stop research that is under way is commonly to sacrifice money already spent and work already done. In the interest of national economy the Board is making at present scarcely any fresh grants, and it has succeeded, with the co-operation of the institutions concerned, in reducing its present commitments by between 10 and 25 per cent. Similar economies in publicity and marketing work enabled the Board to meet the call made upon it by the Treasury last summer for the surrender of £110,000 from its total vote of £550,000. For the present year, 1932-33, the vote of the Board is £300,000.

The Locust Plague.—To combat the grave locust menace in tropical Africa the Marketing Board has joined forces with the territories principally affected. Two locust investigators are now in Africa tracking down the breeding places of the locust swarms, and the Imperial Institute of Entomology in London has been recognised by France and Italy as the international intelligence centre from which the war against the locust in Africa is to be planned by scientists.

Tobacco Culture, Umvukwes.—Although contributions and correspondence regarding subjects affecting the farming industry of Southern Rhodesia are regularly invited, it is very seldom that farmers are prepared to describe their own personal experiences for the information of others interested in the same subjects.

The article on the "Fertilising and Topping of Tobacco," by Mr. L. Worthington-Smith, of Pembi Falls, Umvukwes, which is printed in this issue, is therefore greatly appreciated.

We are confident that this will be read with interest by all tobacco growers.

It is well known that the results of experiments are apt to differ with varying conditions of soil and climate, but the results obtained at Pembi Falls are considered to be of fundamental importance in regard to tobacco culture in this Colony. It is hoped, therefore, that tobacco growers whose

experiences vary from those reported will supply details for publication, as it is recognised that flue-cured tobacco must be for many years to come one of the main sources of income on the lighter soils of the Colony.

African Coast Fever, Melsetter District.—Owing to the repeated recurrence of African Coast Fever in the Melsetter and Chipinga districts, a Departmental Committee was appointed to enquire into the position in detail. The committee consisted of Mr. A. C. Bagshawe (in the chair), the Director of Agriculture, Mr. L. Glanfield (Ballineety Farm, Salisbury) and Mr. A. L. Millar (Estes Park, Salisbury).

Evidence was taken at Melsetter on the 15th and 16th August, and at Chipinga on the 17th.

The Veterinary Department was represented by the Chief Veterinary Surgeon, D.V.S. Coutts, D.V.S. Gordon, D.V.S. Adamson and the Cattle Inspectors at present stationed in the area.

About twenty witnesses gave evidence before the committee, and the report containing the findings of the committee is now being prepared.

HANDBOOK OF TOBACCO DISEASES.

Attention of readers is drawn to the fact that the Department of Agriculture has found it most inconvenient, with the present shortage of staff, to handle the local sales of this book. Arrangements have therefore been made with the Rhodesian Printing and Publishing Company for distribution by them throughout Southern Rhodesia. The book may be obtained from the Herald Store, Salisbury, price 4s., or, postage paid, 4s. 4d.

FURTHER NOTES ON LEAF CURL OF TOBACCO IN SOUTHERN RHODESIA.

By J. C. F. Hopkins, B.Sc.(Lond.), A.I.C.T.A.
Government Plant Pathologist.

In the March issue of this Journal (1) Dr. Storey, of the East African Agricultural Experiment Station, Amani, published his report upon a tobacco disease which he had been invited to investigate. He stated that he considered it to be identical with the leaf curl, which he had recently described from Tanganyika (2), and which he had demonstrated to be transmitted from plant to plant by an insect known as white fly (Aleurodidæ). Since Dr. Storey's departure from Southern Rhodesia, successful transmission of leaf curl from diseased to healthy tobacco has been accomplished at the Plant Pathology Laboratory through the agency of a species of white fly, and it now remains to give an account of the position as it stands to-day with regard to the disease.

Until Storey published his first paper on leaf curl in August, 1931, the cause of the disease was unknown to science, although the presence of a virus had for some time been suspected in Rhodesia (3) and Nyasaland* and probably elsewhere. Roberts (4) claimed to have produced the disease by transferring small brown capsid bugs (*Engytatus volucer*, Kirk.) from diseased tobacco and feeding them upon healthy plants, but he attributed the curling to a physiological disturbance in the plant caused by excretions from the salivary glands of the insects. Repetitions of this work in Rhodesia, using plants in insect-proof cages, have yielded negative results which have also been obtained by other workers (2), (5). Other methods of transmission had been attempted by the writer during the past five years, but

* Private communication.

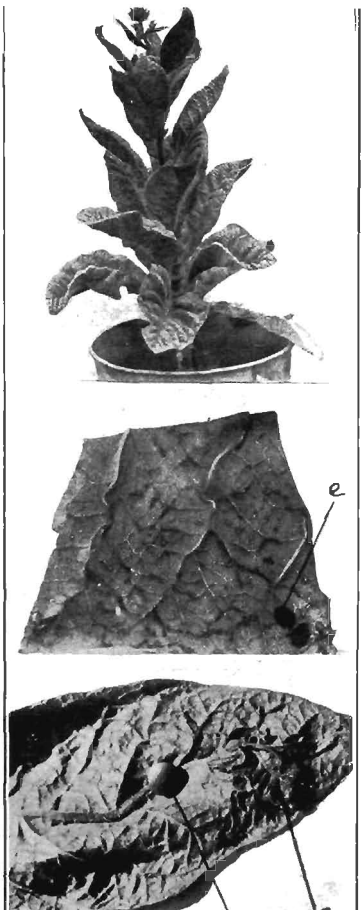

Fig. 1.—Tobacco plant artificially infected with leaf curl by the use of virus-carrying white flies.

Fig. 2.—Vein thickenings (*enations*) as they appear when leaf is held up to the sun. (*e*) Large leafy outgrowth on underside of leaf.

Fig. 3.—Thickenings and growths from lower side of veins, as seen by reflected light. (*e*) Very large enations. (*d*) Drawing pin.

always without success. No serious outbreak in the field had been witnessed, so that the possibility of a dangerous epidemic of leaf curl was considered to be somewhat remote, especially as a few diseased plants could be found in almost any tobacco field. They were, in the great majority of instances, associated with shallow soil and a poorly developed root system, so that the disease was not regarded as being infectious. Each year, however, some investigation was made into the cause of the disease and upon the appearance of Storey's paper recording his experiments, an exchange of photographs was made with that author. It was still uncertain whether the Amani disease was identical with that which I had called "Crinkling" (and which was generally known amongst Rhodesian farmers as "Frenching") owing to the wide variability in symptoms produced by the disease. It was not until Storey visited the Colony that a more definite decision could be arrived at.

In the meantime, reports of serious outbreaks of "Crinkling" were received from several parts of the Colony, and many of the specimens submitted could, by comparison with Storey's photographs, be diagnosed as the Amani disease. Furthermore, white flies were found in abundance on some of the material, but the tobacco aphis (*Myzus persicæ*) and the brown capsid bug (*Engytatus volucer*) were also present and might have been responsible for the curling of those leaves which did not show the typical vein-thickening, regarded by Storey as the only reliable diagnostic character of leaf curl.

A number of tobacco plants, which had been raised from seed under insect-proof conditions, were fortunately available at the time, so that it was possible to start infection experiments with adult insects, raised from the original diseased tobacco by the Entomological Branch of this department. The number of infected insects obtained was small, and as the only available plants were nearly half-grown, the method of infection used was to place five or six insects in a glass tube, 6 inches long by 1 inch in diameter, one orifice of which was closed with cotton wool and the other pressed gently against the under side of a leaf. The glass tube was fixed vertically in a clamp and the leaf was held in position by a pad of cotton wool which was lightly clamped to the upper surface above the mouth of the tube. White flies, aphids

and capsid bugs were used as vectors, but no infection had occurred after a period of one month. All insects were observed to feed upon the leaves. Some of the white flies lived as long as fourteen days, but were not observed to breed in the tubes. The experiment was repeated with a larger number of plants and flies with the same result. Mechanical transmission with infected juice, which had been passed through a porcelain filter (L 3 Chamberland), and was injected into leaves and stems by a hypodermic syringe or was applied to needle pricks on leaves and stems, also gave negative results. If then, it is conceded that leaf curl is due to a virus which is transmitted by white flies, then either the Rhodesian disease was not leaf curl or else our experimental technique was at fault.*

If the latter alternative were true, then one useful fact had been learned from the experiments, namely, that the length of life of the infected adult white fly was about fourteen days. In making recommendations to cope with further early outbreaks of leaf curl, this fact was used as the basis for the formulation of emergency control measures, the remainder being founded upon hypothesis. It was argued this way. If, as there was good reason to suppose, the Rhodesian disease were identical with Storey's leaf curl (although another virus disease might also be present), then the sudden outbreaks of 100 per cent. leaf curl in the early plantings could only be accounted for by the presence of an abundance of *infected* white fly in the lands, and infection must have been obtained from some source close at hand, the most likely being diseased volunteer plants. The obvious line of investigation was therefore to seek these, and a short search brought to light some of the previous year's plants, which had missed the plough and had produced "suckers"

* The reason for the failure of these experiments is not quite clear, because the insects were observed to feed upon the leaf for a period of 12 to 14 days. Two possible explanations present themselves—namely (1) the percentage of infected insects obtained from a leaf curl plant is very small, so that the chances of transmitting the disease with a small number of flies is remote, or (2) the rim if the glass tube, pressing against the underside of the leaf, so injured the cells that the virus was unable to diffuse beyond the enclosed circular area.

The former explanation is improbable, because two or three tubes, containing in all 15 to 20 white flies, were placed upon some of the plants in the second unsuccessful experiment. The wounding hypothesis seems more likely, since several areas of leaf enclosed within the rims of the glass tubes became chlorotic and wilted after five or six days.

showing typical symptoms of leaf curl. White flies were present in hundreds and were breeding freely on all suckers. It was now clear that if all infected plants could be removed from the vicinity of the lands and the white flies killed out, then there would be a good chance of new plantings remaining free from the disease. This is where knowledge of the length of life of the adult fly was urgently required, for if all tobacco were removed and destroyed, then the infected immature stages of the insect upon the plants would also be destroyed, and the adult flies would in time die off without producing an infected succeeding generation. If they did breed, which was unlikely, then they would in all probability do so upon plants which were not susceptible to leaf curl. It was therefore necessary to know how long the lands were required to be kept fallow before re-planting could be carried out with safety, and, as the season was already well advanced, the minimum period of safety was an important factor. After taking into account a number of considerations, it was eventually decided to allow three weeks to elapse after the last tobacco had been destroyed before new seedlings were to be planted out. This period of time appears to have been adequate because very little infection appeared in the second plantings.

The position, then, when Storey arrived was that there appeared to be two similar virus diseases of tobacco in Rhodesia, one closely resembling his leaf curl and associated with the presence of white flies and another which I called "Crinkling" (but was popularly known as "Frenching," which is a distinct disease), the cause of which was not definitely determined. The former had appeared in epidemic form in several parts of the Colony, the latter appeared to be unimportant economically. Infection experiments using white flies, aphids and brown capsid bugs had yielded negative results, but field control recommendations based upon Storey's results at Amani were apparently turning out successfully.

The position as it actually is has been made clear by Storey in his report (1) and is confirmed by the following work.

Young tobacco seedlings, which had been raised from seed under insect-proof conditions, were potted out in rich

soil, one plant to a pot, in the previously fumigated, screened glass-house, the hands of the operator being washed between each planting. The seedlings were then covered by Dietz lamp glasses, the open tops of which had been closed by fine muslin. Three days later white flies obtained from leaf curl tobacco plants were introduced into the lamp glasses, 25 flies to each plant. Six plants received flies collected in Salisbury and four plants were infested with insects from Mtepatepa district. Ten plants were grown under lamp glasses without white flies and served as controls. As Storey had experienced difficulty in inducing the insects to leave the tops of the lamp glasses and feed upon the seedlings, it was decided to cover the glasses with brown paper bags, leaving a small orifice at the base where light could enter. After 24 hours the bags were removed and flies were observed to be feeding on all plants.

A week later the pots were taken from the glass-house and the lamp glasses removed. The seedlings were then washed thoroughly with 1-250 nicotine and soft soap solution and replaced in the glass-house, which had again been fumigated. Control plants were similarly treated.

Two weeks later some of the infected plants showed clearing of the veins of the leaves and slight curling of the midribs and leaf blades. Within three weeks eight out of the ten treated plants showed typical symptoms of leaf curl, including curling of leaves, thickening of veins and large leafy outgrowths (*enations*) from the lower sides of the veins. All plants were kept under insect-proof conditions for some weeks, after which time the eight treated plants had produced flower heads, and exhibited the same symptoms as are commonly encountered in Rhodesian tobacco fields. All control plants remained healthy.

The appearance of experimentally produced leaf curl in Orinoco White Stem tobacco is shown in Fig. 1. The typical thickening of veins, as seen by transmitted light, is shown in Fig. 2, in the bottom right-hand corner of which can be seen a large leafy outgrowth (*enation*). Fig. 3 shows exceptionally large enations on an old leaf.

It will therefore be seen that leaf curl of tobacco in Rhodesia appears to be identical with that occurring in Tanganyika, being due to a virus which is transmitted from

plant to plant by an insect known as white fly, but is not transmissible mechanically on the hands of labourers. The control measures, which have already been recommended and are fully detailed in Storey's report (1), are the best that can at present be formulated, so that the tobacco grower must realise at once that the prevention of further development of the disease in the Colony rests mainly with himself.

The important fact to remember is that the uninfected white fly by itself is harmless; it is only the infected insect which can produce leaf curl in healthy tobacco. If all sources of infection are removed immediately after reaping is completed, then there will be no reservoir for the flies to feed upon at the beginning of the following season, and the disease is unlikely to make its appearance. All old stalks should therefore be uprooted and destroyed and a diligent search made for volunteer plants in old lands, near grading sheds and offices, and in the native compound. No plant should be allowed to remain growing in odd crevices and corners of buildings, as so often happens, for a great number of these will be found on examination to be infected by leaf curl. Similarly, diseased plants which appear in the lands should be removed at once in order to prevent the establishment of a seat of infection for the remainder of the crop.

All growers are asked to co-operate in the eradication of leaf curl, for it is quite possible that the disease, if allowed to spread unchecked, will become a menace to the whole tobacco industry of the Colony.

Investigations are still proceeding at the Agricultural Laboratories, Salisbury, into a number of problems connected with leaf curl. The life history and hibernation habits of the white fly are being studied by the Entomology Branch, whilst the question of alternate host plants is engaging the attention of both Plant Pathology and Botany Branches. Already a wild, shrubby species of *Vernonia* is suspected of harbouring the disease. White flies obtained from this plant and placed upon tobacco did not, however, transmit leaf curl, but the number of flies obtained was very small, and previous experiments have shown that about 25 is the minimum number required per plant in order to obtain a high percentage of successful transmission. Further experiments are being planned.

Preliminary selection of resistant varieties has kindly been undertaken by Dr. Storey, whilst seed is being kept from an artificially infected plant in Salisbury, which developed only mild symptoms of the disease.

It is hoped that a fuller knowledge of the habits of the insect vector and the host range of the virus may put the Department into the position of being able to evolve control measures as equally successful as those recommended for the control of mosaic.

My thanks are due to Dr. Storey for arranging the successful transmission experiment described above and for fully demonstrating his technique.

SUMMARY.

1. An account is given of preliminary investigations into the nature of leaf curl disease of tobacco, and the position as it stood before Dr. Storey's visit last January.

2. Successful experiments in the transmission of the disease by the agency of white flies (*Aleurodidæ*) are described.

3. Recommendations are given for the control of the disease.

4. Further research is being undertaken in connection with the life-history of white flies and the presence of alternate wild host plants.

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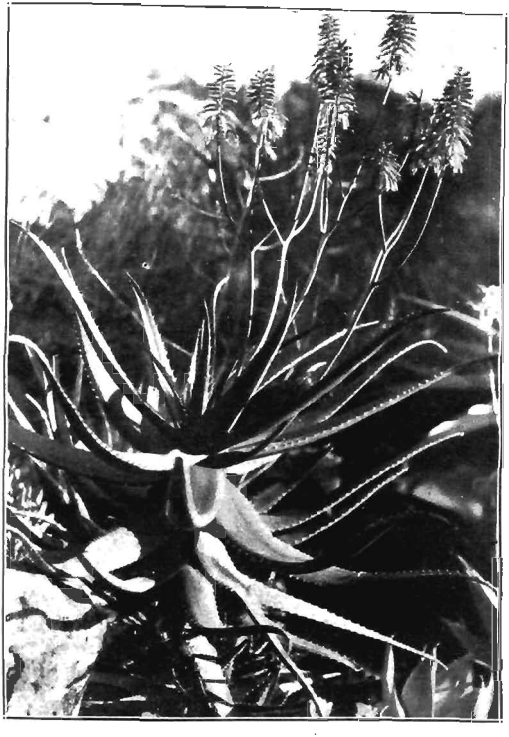
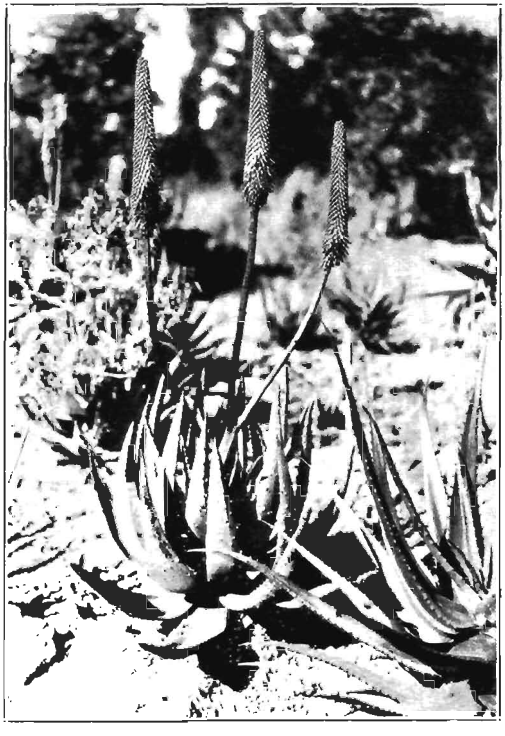


A. Hildebrandtii (common variety).

A chaboudii



A. aculeata

NOTES ON AFRICAN ALOES.

By H. Basil Christian, Ewanrigg, Arcturus.

PART I.

From a gardening point of view the growing of aloes has several advantages which are not possessed by the ordinary plants grown for decorative purposes. Aloes are perennials, and once they are planted they continue growing and flowering for many years. Once established, they can persist throughout the driest seasons without watering, although certain species from the winter rainfall areas or mist belts thrive much better with an occasional watering in our winter.

Aloes transplant very easily—even the biggest plants—and the drier they are at the time, the better. The leaves are then less brittle and not so liable to break off, and they weigh much less.

It is not necessary to try to preserve the roots; it is better to cut these right back. Aloes having stems need not necessarily be dug out by the roots. If sawn or cut off and the upper portion bearing the leaves planted, they will grow. Most species can remain out of the ground for a considerable time before being replanted without suffering any permanent damage.

Certain aloes have the habit of throwing out suckers from the base in the case of acaulescent or stemless species, or from the stem in the case of arborescent aloes, or species having stems. Certain other acaulescent plants throw out underground runners which produce plants at a distance from the parent plant. All these suckers, if cut off and planted, will grow readily, so that it is possible to increase one's stock of plants rapidly and cheaply.

The principal flowering time in Southern Rhodesia for most aloes is from May to August, a time when, to get a

show of ordinary flowers, constant watering is necessary, but there is hardly a month in the year when there is not at least one species in flower.

Growing aloes from seed is an interesting sideline, as they hybridise freely, and in an aloe garden where many different species are grown, there is likely to be a certain amount of cross-fertilisation, and, as often as not, a certain number of hybrids will make their appearance. Often these hybrids are more beautiful than the parents, and, in my experience, are generally more vigorous.

Most aloes improve under cultivation, but, on the other hand, there are certain species that are difficult to grow, or, if one succeeds in growing them, to induce to flower away from their natural habitat. To a really keen gardener this adds greatly to the interest of growing them, and if one has a bit of luck and succeeds where others have failed, well, the others don't feel as one does!

There are certain diseases and pests which attack aloes.

White Scale.—This appears on the leaves and can easily be cured by the mechanical action of washing with soft soap and water, preferably warm.

Rust.—This first shows in circular patches on the leaves, and can completely kill the plant. The Government Mycologist recommends dusting with sulphur.

Certain species of weevils bore into the plant, deposit their eggs and later on white grubs hatch out, which eat into the heart of the plant and may kill it if not taken in time. If noticed in time, the grub can be picked out with a knife, and little permanent damage is done to the plant. The moment one notices the small young leaves in the crown of the plant showing signs of rotting, get busy with the knife.

Dr. Pole Evans, Chief of the Division of Botany in the Union, says that at the Union Buildings, Pretoria, where they have the largest and most complete collection of aloes in the world, the practice is to spray with a solution of concentrated tobacco juice and arsenate of lead after the first rain and thereafter once a month. This is as a preventive, and has not been a complete success with me.

Another remedy I have recently heard of from a keen collector is to pour a few drops of carbon bisulphide into the crown of the plant. It is claimed that unless the plant is too far gone, this treatment will save it.

Some species from the more arid regions suffer from the heavy rains in the wet season. The only precaution I can suggest, apart from covering with glass, is perfect drainage, and this does not always succeed.

There are a few botanical terms it will be necessary to use from time to time in the notes on the different species.

Acaulescent	Stemless
Caulescent	Having stems.
Arborescent	Tree-like, or having stems.
Peduncle	The flower-stem bearing the inflorescence.
Periauth	The tubular or bell-shaped part of the flower.
Perianth segments ...	The upper part of the perianth not connected into a tube.
Corolla tube	The lower part of the perianth.

Aloe Chaubaudii.—This is the commonest and most widely distributed of our Southern Rhodesian aloes. It ranges from the Victoria Falls and Umvukwes in the north, Matopos in the west to Melsetter in the east and Victoria in the south, and extends into the Northern Transvaal.

It is always found on or at the base of granite kopjes. I have not heard of it growing on our red soils.

It often, but not always, throws out suckers from its base.

It is an acaulescent plant with pale glaucous leaves about 18 ins. long, unspotted, with prickles on the margins but none on either face. The inflorescence is a loose panicle with ascending branches, and grows to a height of 2-3 ft. in its wild state. The flowers are pale brick red.

It flowers in June and July and into August.

There is a variety of this in the Matopos which is more densely flowered and is in flower some weeks earlier than the common variety.

A third variety which is rare and so far has only been recorded from the Victoria district has pure yellow flowers.

Aloe Hildebrandtii.—This aloe is widely distributed over Southern Rhodesia, extending from the Matopos to Umtali and from the Northern Umvukwes to Victoria, but is nowhere as common or plentiful as *A. chaubaudii.*

The leaves become copper colour in the winter. It flowers in June and July, and the colour of the flowers varies very considerably.

It is generally confined to granite kopjes, and generally suckers from base of stem.

It is an arborescent plant, with the stem up to 3-4 ft. high or more. The leaves are rich green, turning to copper colour in winter, unspotted, except in case of young plants, which may have a few oblong white spots towards the base of the leaves. There are prickles along the margins of the leaves, but not on either face; inflorescence one or several from same rosette of leaves; peduncle branched; flowers in rather lax racemes.

A variety with denser racemes, which are more cylindrical, red above and white or pale yellow below, occurs in the Umtali district, whence I have obtained the only pure canary-yellow specimen I have seen.

Aloe aculeata.—This also occurs in the Matopos, Bembesi, Enkeldoorn and Victoria districts, and is probably even more widely distributed. It also occurs in the Northern Transvaal.

It is stemless, or with a short stem up to 3 ft. high, and it flowers in July and August.

The leaves have prickles on the margins and on both surfaces. The peduncle is usually branched and grows to about 3 ft. high to the top of the inflorescence, the branches ending in dense racemes up to 12 inches long. The flowers are strongly reflexed, and when open the stamens and style project from the perianth.

There are at least two varieties of this aloe in Southern Rhodesia, unless the botanists decide that they are separate species. The variety illustrated has very few prickles on the

upper surface of the leaf, and the flower spike is dark orange in colour.

The other variety is very much more copiously studded with prickles on both surfaces of the leaf, and the raceme is red above and yellow below. It comes into flower earlier than the first variety.

(To be continued.)

SALES.

AGRICULTURAL EXPERIMENT STATION, SALISBURY.

Spineless Cactus Slabs (blades) Algerian variety, per 100 slabs, 7/6 Salisbury, or 12/6 delivered free by rail to purchaser's nearest station or siding in Southern Rhodesia. For amounts of 500 slabs or more a reduction of 2/6 per 100 will be made.

Stocks are limited and delivery cannot be undertaken after 15th November.

Kudzu Vine Crowns, per 100 crowns, 15/-, Salisbury, or 25 crowns, 7/6; 50 crowns, 15/- and 100 crowns, 22/6, delivered free to purchaser's nearest station or siding in Southern Rhodesia. Delivery during September and October for irrigated land, and in January for dry land. Owing to pressure of other operations, it is not possible to deliver Kudzu crowns during November and December.

The prices quoted above do not include charges for road motor transport. Cheques should be made payable to the Department of Agriculture, and preliminary enquiries and subsequent orders should be addressed to the Chief, Division of Plant Industry, Department of Agriculture, Salisbury.

EFFECT OF APPLICATION OF LIME TO THE SOIL ON THE DRYING-OUT OF MAIZE.

By The Chemical Branch.

In a previous article published by this branch in the December, 1931, edition of the *Rhodesia Agricultural Journal*, attention was drawn to a statement by Blair, of the New Jersey Agricultural Experiment Station, who reported that the results of certain liming trials carried out in New Jersey indicate that liming of soils tends to give uniform ripening and drying of the corn, and that maize grown on acid soils does not mature and dry out quite so early as maize grown on soil containing a fair supply of lime.

As this is a matter of general interest to farmers in Southern Rhodesia, it was arranged with the Chief, Division of Plant Industry, for maize being grown on the Salisbury Experiment Station in liming experiments to be placed at our disposal for analysis during the drying-off season.

These liming experiments are being carried out on plots that have been under continuous cultivation for about 20 years and have never, during this period, been limed.

The soil on these plots was shown by analysis to be much more acid than the average soil on the Experiment Station, and, although the limed plots received lime at the rate of 1 ton to the acre, this was not sufficient to meet its lime requirements and hence the soil was still acid.

The method adopted was for 5 or 6 cobs to be taken from limed plots and unlimed plots at fortnightly intervals commencing at the beginning of May, and subjecting them immediately to analysis for their moisture content.

All the plots received a basal dressing consisting of 200 lbs. of superphosphate and 25 lbs. of muriate of potash

per acre before planting. The limed plots, in addition, received one ton of lime per acre. The following are the results obtained:—

Dates of sampling.	3.5.32.	17.5.32.	31.5.32.	14.6.32.	28.6.32.	13.7.32.
Plot with no lime . .	33.2	28.2	19.1	18.3	13.6	11.2
Plot with lime	29.1	26.7	22.6	18.4	12.3	11.8

Result.—From the above figures, it will be seen that the application of 1 ton of lime to the acre on a markedly acid soil exercised no beneficial influence on the drying-out of the maize.

Effect of Different Methods of Applying Fertilisers on the Drying-out of Maize.

At the request of the Manager, Salisbury Experiment Station, a number of tests were carried out on the moisture content of maize at fortnightly intervals from the beginning of May until the beginning of July in order to determine whether the method of applying fertiliser exercised any influence on the drying-out of the maize.

Observations made in the field by the Manager during previous years had led him to believe that maize grown in plots to which fertiliser had been applied direct in the holes dried out quicker than maize from plots where the fertiliser had been broadcasted. The treatment each plot received was 150 lbs. of superphosphate per acre at the time of planting.

Results of Analysis.

Dates of sampling.	10.5.32.	23.5.32.	7.6.32.	21.6.32.	5.7.32.
Plot with fertiliser broadcast	29.4	24.1	18.8	15.5	14.3
Plot with fertiliser put in holes . . .	30.6	23.6	19.7	14.6	14.1

Result.—Determinations of the moisture content of maize at fortnightly intervals during the drying off season gave no indication of any particular beneficial effect being derived from applying the fertiliser in the hills as against applying it broadcast.

CREAM CHEESE.

By F. A. Lammas, Dairy Officer.

The practice of soft cheese-making is not very common in this Colony, probably chiefly on account of adverse climatic conditions and long distances of transport.

As a general rule, soft cheese contains a high percentage of moisture, in consequence of which keeping qualities are seriously hampered, and manufacturers of this type of cheese have frequently found their produce to be of inferior quality before it has been marketed.

Cheese of the hard, pressed variety—such as Cheddar, for example—always finds a ready sale, for this type of cheese has become well known, has fairly good keeping qualities, and moreover is no longer looked upon as a "delicacy."

Soft cheese, however, does not enjoy the same popularity, and it is only amongst certain people that a demand is created.

That a market does exist for a limited amount of soft cheese, especially cream cheese, in this Colony is beyond a doubt: it remains only for the farmer or manufacturer to cultivate this taste for soft cheese in our larger towns and to capture and retain this waiting trade by keeping before the public a well-made and tastefully displayed article.

Requirements.—As in all branches of dairying, the manufacture of cream cheese calls for cleanliness and constant supervision, and it is the duty of the maker to attend to every branch of this business in person.

Cleanliness is essential, for as already stated cream cheese contains a high percentage of moisture, and unless the milk is produced under scrupulously clean conditions the final product will have poor keeping qualities.

Apparatus.—With the exception of a dairy thermometer and a small supply of liquid rennet, all the apparatus necessary—namely, enamel pails, linen or calico cloths—will be found amongst the usual household equipment.

If, however, the cheese is to be made on a large scale, it will be necessary to obtain proper moulds, straw mats, cheese paper, etc. Even then the initial outlay for equipment would be very small.

A cool room in which to manufacture cream cheese is essential. This type of cheese should be marketed or consumed immediately after manufacture, for it is doubtful whether this cheese would retain the desired flavour for more than a few days under ordinary farm conditions.

Kinds of Cream Cheese.—There are several varieties of cream cheese on the market to-day, and there appears to be no uniformity with regard to manufacture.

As the name applies, cream cheese—strictly speaking—is the product obtained by treating cream only, but the term is applied equally to cheese made from milk to which cream has been added.

Rennet Cream Cheese.—This variety of cream cheese is made from thin cream which is coagulated by the addition of rennet.

Perfectly fresh cream containing 25 per cent. to 30 per cent. butter-fat is placed in an enamel pail and regulated to a temperature of 65 to 70 degrees Fahrenheit. It should be the aim of the producer to maintain this temperature throughout the entire process.

Starter is sometimes added at the rate of one half-pint to each gallon of cream. The starter for preference should be the culture of lactic acid bacteria as used by most cheese-makers, and if regular quantities of cheese are to be made it is advisable to propagate a starter from day to day. Clean, sour milk used in amounts as outlined above will serve the purpose equally as well, especially when the cheese is intended for home use only.

As soon as the desired temperature is reached, rennet is added at the rate of six to eight drops per quart of cream. The rennet before being added is diluted with a little cold water.

The cream is then thoroughly stirred for five minutes, the basin covered with a muslin cloth and the cream left to thicken for eight to twelve hours.

When the cream has coagulated the curd is ladled on to dry linen cloths which have been spread over wooden draining racks, measuring approximately two feet square, and allowed to drain for about one hour or until whey ceases to escape. The ladling must be done with the utmost care, so that the curd is broken as little as possible.

The linen cloths should be about one yard square, and no more than one half-gallon of curd should be placed in each, or drainage will be slow and the cheese apt to become sour very quickly, especially during hot weather.

When most of the free whey has escaped from the curd on the draining rack the cloths should be tied up, bag fashion, by taking up the four corners and fastening with a piece of string and hung up to drain in a draughty place where the atmosphere is pure.

Every few hours the cloths should be opened, the cream scraped from the sides and mixed with the cream in the centre. The cloth is then retied and hung up to drain.

It is advisable to change the cream into at least one fresh cloth—indeed, the oftener the cloth is changed the quicker will be the drainage.

In cleaning these cloths they should be washed in hot water and then boiled.

Twenty-four hours at least are required for draining, but it is advisable to hasten this as much as possible, especially during the summer months. This may be done by applying a little pressure to the curd.

Place the bag of cream on the draining rack and weigh it down by placing a bucket half filled with water (about one gallon) on a board resting on the cream. Pressure should on no account be applied until the curd has been partially drained.

Drainage is complete when the cheese has a firm but pasty consistency. Salt is then added to taste; usually one teaspoonful of fine dairy salt to one half a gallon of cream will be found sufficient.

Turn the cheese out into a basin and thoroughly mix the salt with it. The addition of salt assists in bringing out the flavour.

This cheese may be moulded in various shapes. A simple form of mould is one resembling a tin lid. The mould is lined with butter muslin or grease-proof paper, into which the cheese is filled. The paper or muslin is then wrapped over the cheese and a small weight applied to give pressure for a few minutes. The cheese is then turned out of the mould. When grease-proof paper is used the cheese is usually wrapped in tinfoil or put up in cardboard boxes.

A very convenient means of marketing this cheese is in cartons or cylindrical paraffin-waxed cardboard cases obtainable in quart, pint and one half-pint sizes and fitted with a disc lid.

Yield of Cheese.—One gallon of cream with a 25 to 30 per cent. butter-fat consistency will produce about 5½ to 6 lbs. of cheese. This will serve as a rough guide when it is desired to make a particular quantity of cheese.

Cervais Cream Cheese.—This is a very popular variety of French cheese, made from a mixture of milk and cream in the proportion of two parts of milk to one part of cream.

Under local conditions, however, it is recommended that equal parts of milk and cream be used, the milk being perfectly fresh and the cream obtained from the previous skimming. The cream should contain 30 to 35 per cent. butter-fat.

The milk and cream are thoroughly mixed one half-hour before the rennet is added.

Regulate the temperature to 65 to 70 degrees Fahrenheit, and add six to eight drops of rennet (diluted with water) to each quart of the mixture of milk and cream and stir well for five minutes.

For the first three or four hours the surface of the mixture should be occasionally stirred gently to prevent the cream rising to the surface.

Ten to twelve hours will be found necessary for the curd to coagulate firm enough for ladling.

The curd is then carefully ladled out on to cloths on draining racks and allowed to drain for about one hour until most of the free whey has escaped, after which the cloths are tied up as already explained and hung up to drain.

The cloths, to assist rapid drainage, are opened frequently and the thick cream scraped from the sides and mixed with that in the centre.

When the curd is sufficiently firm, salt is added as previously described.

Moulding.—The Gervais moulds consist of six to twelve cylindrical moulds fixed to one base. The moulds are lined with blotting or similar paper and are carefully filled with the curd, pressing the curd in with a knife. The mould is then placed on a straw mat on a board and the cheese left in the moulds to drain until it is sufficiently firm. The cheese may then be removed from the moulds and stored in a cool room.

Cream cheese and Gervais cheese are best eaten when fresh.

THE EFFECT OF FEEDING SUNFLOWER SEED ON THE QUALITY OF BACON.

By C. A. Murray, B.Sc.(Agr.), M.Sc., Lecturer in Animal Husbandry, Matopo School of Agriculture and Experiment Station, Rhodes Matopo Estate, Southern Rhodesia.

One of the most common complaints of the bacon factories in Southern Rhodesia is that a very large percentage of the bacon pigs received are soft and oily and are, therefore, unsuitable for the production of good quality bacon.

Apart from the fact that unthrifty, slow maturing, unfinished pigs generally have soft fat, it has been shown overseas by Hankins and Ellis (1926-1928), and in South Africa by Romyn and others (1930), Schutte and Murray (1931) and Murray (1927-1930), that certain feeds produce a similar effect, especially those containing a high percentage of fat composed mostly of unsaturated or liquid fatty acids.

The experiment reported on in the present paper is the first of a series planned to investigate the softening or hardening properties of some feeds commonly fed to bacon pigs in Southern Rhodesia.

This experiment deals specifically with the suitability of sunflower seed as a feed for bacon pigs.

Review of Literature.—Because it has generally been considered an unprofitable grain crop in most countries (Henry and Morrison, 1923), sunflower seed has not been used extensively in overseas countries as a pig-feed, and consequently little research work has been done on its feeding qualities for pigs.

Day (1924) stated that Weaver, in a trial at the Missouri Experiment Station, found sunflower seed satisfactory when it was fed in equal proportions with maize to 100-pound pigs. Although this ration compared favourably with one of maize meal and meat meal, sunflower seed alone proved unsatisfactory.

Hankins and Ellis (1926), quoting Henriques and Hansen in Denmark, pointed out that sunflower seed produced soft pork.

In Southern Rhodesia, Timson (1928) stated: "When crushed and mixed with other feeds, it forms a valuable ingredient of the ration for cattle, sheep and pigs." Hamilton and Corry (1928) also recommended sunflower seed as a feed for bacon pigs.

PLAN OF EXPERIMENT.

The experiment was carried out at the Matopo School of Agriculture and Experiment Station during the period 3rd July, 1931, to 1st January, 1932.

Experimental Pigs.—Two similar groups of eleven pigs per group consisting of pure Large White and Large White x Large Black weaners were used. In the division of the pigs into the two experimental lots, due consideration was given to their breeding, ages, weights and condition.

Rations Fed.—The following rations were fed to the two groups of pigs:—

Group I. (Maize Group): 100 parts by weight of maize meal; 2 pounds of separated milk for every pound of concentrates fed.

Group II. (Sunflower Group): 50 parts by weight of maize meal; 50 parts by weight of sunflower seed; 1 pound of separated milk for every pound of concentrates fed.

To each of the above rations 3 per cent. by weight of minerals (consisting of equal parts of bone meal, salt and fine wood ashes) were added.

The two rations had the same nutritive ratio (1: 6.0).

The pigs were fed concentrates in the form of a thick slop, and were given as much as they would clean up in 15 to 20 minutes twice daily. Any separated milk left over after mixing with the concentrates was given at mid-day.

Both groups always had access to clean drinking water and received small amounts of green feed daily. When the latter was not available, a teaspoonful a head daily of cod liver oil was fed in the ration.

The pigs were regularly weighed at fortnightly intervals until they approached market weights. After this weekly

As they reached the desired finish for slaughter, they were tagged, weighed and sent by motor lorry to the abattoirs of the Rhodesian Export and Cold Storage Co., Bulawayo, a distance of 23 miles, where they were slaughtered, dressed and cured into bacon. The pigs were always sent off in the early morning (about 6 a.m.) and arrived at the factory an hour later.

After slaughtering and dressing, a number of measurements were taken, the carcasses were inspected in detail and classified into the different grades according to Duckham's (1929) standards.

1. Circumference of ham.
2. Thickness of back-fat at loin.
3. Depth of side at flank, round the outside.
4. Thickness of back-fat at back. Thinnest point.
5. Depth of side at shoulder, round the outside.
6. Thickness of back-fat at *shoulder. Thickest point.*
7. Thickness of back-fat at nape.
8. Length of side from the anterior end of pelvis to the anterior face of the first rib.

Plate 1.—Figure illustrating the positions where the carcass measurements were taken.

After chilling, the carcasses were again inspected and examined as regards the texture of the fat. Unfortunately, apparatus was not available to determine the refractive indices of the fat.

EXPERIMENTAL RESULTS.

Table I.—Comparison of average growth data for two groups of pigs fed maize and sunflower seed respectively:—

	Maize, Group I.	Maize and sunflower, Group II.	Difference and standard error of the difference between means of groups.
No. of pigs per group	10.0*	11.0	... ...
Average initial weight ... . .. lbs.	58.6	60.6	1.0 ± 5.2
Average marketing weight ... lbs.	210.7	201.1	9.6 ± 9.7
Average initial age . . .. dys	73.8	74.7	0.9 ± 3.5
Average marketing age . . .. .. dys.	200.6	209.0	8.4 ± 17.7
Average daily gain in weight ... lbs.	1.20	1.05	0.15 ± 0.06

* A few days after the commencement of the experiment one pig became sick and had to be removed from the experiment. The necessary feed adjustments were made.

Growth of Pigs.—Throughout the experiment the maize-fed pigs had a slightly more thrifty appearance than those *fed sunflowers. The rate of growth for the Maize group* was satisfactory (1.20 lbs. per day), but for the Sunflower group it was only fair (1.05 lbs. per day).

This difference in rate of gain in live weight, though small, is significant. The other differences are not significant. (Fisher, 1925, page 109.)

As regards uniformity in rate of daily gains, there was little difference in the co-efficients of variation (2.9 per cent.) between the two groups, the Maize group having a co-efficient of 14.1 per cent. and the Sunflower group a co-efficient of 11.0 per cent.

The marketing weight of the maize group was on the average 9.6 lbs. higher than for the Sunflower group, and this figure was reached 8.4 days sooner in the Maize group. The variation in the figures composing these averages indicates that the difference has no statistical significance.

The average marketing ages were 201 and 209 days for the Maize and Sunflower groups respectively. In practice, the former would be considered satisfactory, but the latter somewhat too high.

Table II.—Comparison of shrinkage in transit:—

		Maize, Group I.	Maize and sunflower, Group II.	Difference and standard error of the difference between means of Groups I. and II.
Average marketing weight	lbs.	210.7	201.1	9.6 ± 9.7
Average factory weight	lbs.	200.4	191.7	8.7 ± 9.7
Average shrinkage in transit	lbs.	10.3	9.4	... ...
Average shrinkage in transit	%	4.9	4.7	0.2 ± 0.6

Shrinkage in Transit.—In both groups the shrinkage was just under 5 per cent. Although a bit high for such a short journey, it was certainly not excessive. There was no significant difference in shrinkage between the two groups.

Table III.—Feed consumed per 100 lbs. gain in live weight, and approximate costs:—

		Maize, Group I.	Maize and sunflower, Group II.
Concentrates per 100 lbs. gain in live weight	lbs.	293	333
Separated milk per 100 lbs. gain in live weight	lbs.	587	336
Total feed per 100 lbs. gain in live weight(1)	lbs.	391	389
Cost per pound of gain(2)	pence	2.6	2.9

(1) Assuming 6 lbs. of separated milk equivalent to 1 lb. of concentrates.
(2) Maize meal £5, sunflower seed meal £7, bone meal £10 and salt £3 10s. per ton; separated milk 1½d. per gallon.

Feed Consumption.—It is shown in Table III. that the Maize group required 293 lbs. of concentrates and 587 lbs. of separated milk, and the Sunflower group 333 lbs. of concentrates and 336 lbs. of separated milk respectively, or reduced to a common basis of feed equivalent, 391 and 389 lbs. respectively, to produce 100 lbs. gain in live weight.

In the Maize group 25.1 gallons of separated milk saved 40 lbs. of grain, i.e., 6.3 lbs. of separated milk saved 1 lb. of grain. From the point of view of economy of growth, both rations seem to have been equally efficient.

On account of the difference in market values of the rations at the time the experiment was carried out, the cost per pound of gain in live weight was higher in the Sunflower group (2.9d.) than in the Maize group (2.6d.).

With better average daily gains than shown in Table I., and, therefore, earlier maturity, there is no reason why the cost of producing a pound of gain in live weight should not be reduced in the case of both rations.

Table IV.—Carcass measurements and grading:—

		Maize, Group I.	Maize and sunflower, Group II.	Difference and standard error of the difference between means of Groups I. and II.
Average length of side	ins.	30.8	30.7	0.1 ± 0.6
Average depth of shoulder	ins.	18.0	17.9	0.1 ± 0.4
Average depth of flank	ins.	16.7	16.6	0.1 ± 0.4
Average circumference of ham	ins.	24.3	24.2	0.1 ± 0.5
Average thickness of backfat at:—				
Nape	ins.	1.38	1.24	0.14 ± 0.09
Shoulder	ins.	2.19	1.99	0.20 ± 0.09
Back	ins.	1.19	1.05	0.14 ± 0.09
Loin	ins.	1.59	1.46	0.13 ± 0.11
Carcasses faulted on account of—				
(a) bad proportion of lean to fat	%	0	0	
(b) bad proportion of fat to lean	%	20	9	
(c) heavy shoulders	%	40	18	
(d) thin bellies	%	20	45	
Grading of carcasses(1)—				
Prime	%	50	55	
Medium	%	40	27	
Stout	%	10	9	
Inferior	%	0	9	
Carcasses with soft or oily fat(2)	%	0	100	

(1) In the grading of the carcasses the firmness of the fat was not taken into consideration.

(2) In the Maize and Sunflower Groups, eight and nine carcasses respectively were inspected for texture of fat. In the Maize Group all eight were firm, and in the Sunflower Group all nine were soft and oily.

Suitability of the Carcasses for Bacon Production.—From Table IV. it will be noticed that there was no difference between the two groups of pigs as regards length and depth of side and ham development.

There was a tendency throughout for the back-fat to be slightly thicker at the nape, shoulder, back and loin in the Maize group than in the Sunflower group.

Insufficient numbers were available to prove this definitely in the case of the individual fat measurements, but when the measurements for the four positions of back-fat were averaged, the tendency could be definitely proved from a statistical standpoint. (Mellor, 1902; Fisher, 1925.)

No carcasses were considered to be deficient in lean meat. In the Maize group 20 per cent. and in the Sunflower group 9 per cent. were faulted on account of excessive back-fat.

In the Maize group more carcasses were faulted on account of heavy shoulders than in the Sunflower group, and in the Sunflower group more were faulted on account of thin bellies than in the Maize group.

As regards the different grades, Duckham (1929) points out that, according to the requirements of the British market, "*prime* quality bacon is easily marketed, whereas the market for *medium* carcasses is more limited. *Inferior* and *stout* carcasses are definitely unsuitable and are not wanted."

Both groups had the same percentage of *prime* carcasses, but the Maize group had more *medium* and fewer *inferior* carcasses than the Sunflower group.

The grading does seem to indicate that the Maize-fed pigs were, on the whole, slightly fatter at marketing than the Sunflower-fed pigs. This statement is further supported by the larger percentage of carcasses faulted on account of too much back-fat and heavy shoulders in the Maize group than in the Sunflower group, and the larger percentage of thin bellies in the latter group than in the former. The slower rate of maturity and lower marketing weight of the Sunflower group probably account partly for this difference in finish.

The effect of sunflower seed on the texture of the fat was very striking. In the Sunflower group all the carcasses were absolutely soft and oily, whereas in the Maize group

all were considered firm. The carcasses from the Sunflower-fed pigs were so soft and oily that it was not possible to use them for bacon manufacture.

SUMMARY.

(1) Results are reported of an experiment conducted at the Matopo School of Agriculture and Experiment Station to ascertain the effect on the quality of bacon of feeding a ration containing 50 per cent. of sunflower seed.

(2) From a growth point of view, 50 per cent. of sunflower seed in a ration of maize meal and separated milk proved satisfactory.

(3) This ration produced very soft and oily fat without exception.

(4) There are indications from the grading and from measurements of back-fat that the pigs fed on the control ration had thicker back-fat than the pigs fed on a ration containing 50 per cent. of sunflower seed.

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FERTILISER TREATMENT: ITS RELATION TO GROWTH IN TOBACCO.

By LEONARD WORTHINGTON-SMITH, Pembi Falls, Umvukwes.

Before entering into a detailed description of some experiments which I have been carrying out in an endeavour to discover the best conditions for developing the growth of the tobacco plant, I feel some explanation of the underlying principles governing the course of the tests is called for.

An immense amount of research has been carried out in America as well as in this country into every factor that can have a bearing on the problems that face the grower of tobacco, and a vast store of knowledge has been accumulated —investigations into the chemical conditions existing in the leaf during the growing period—during curing and ripening —the influences on the conditions effected by topping, suckering and so on, have been reduced to an exact science, and one can have access to tabulated results, curves and what not galore. Similarly extensive researches have been made into the varied effects of different fertilisers, taking into consideration soil conditions and so on and so on *ad infinitum*: one is deluged under a sea of facts, and I fear one emerges rather more confused than enlightened.

My own personal view has been that we should each of us try and establish a set of facts for ourselves based on the results of well thought out experiments on the soils of our own farms, for it is undoubtedly true that what may be found to be a suitable treatment to apply to the tobacco plant in one area under one set of conditions may be by no means the best on one's own area under different conditions of soil, altitude and rainfall.

The principal difficulty one is up against lies in the fact that influences of a totally different order all have a bearing on the main problem—which is to discover how to obtain

the most favourable plant growth—the original constitution of the soil—the rainfall in any particular season—and the amount and description of fertiliser applied. Before one can hope to arrive at any definite conclusion, it is essential that only one of these variable factors be investigated at one time; of the three factors mentioned above two must remain as constants and one the variable factor to be investigated. The two conditions which no one can effect, i.e., original soil constitution and rainfall I have treated as constants, and have confined myself in these experiments to fertilisers and their application.

By taking care that in all cases of comparative fertiliser experiments all the plantings to any particular tests were made on the same day from seed originally sown in the beds the same day, I have ensured that the incidence of rainfall was uniform for the whole test periods.

Similarly all separate tests have been carried on fields which showed the least soil variation—and finally all operations such as priming, topping and suckering have always been carried out simultaneously over the whole of the test plot.

This same problem of the variable factor, of course, is evident when one begins to investigate the effects of the various constituents of artificial fertilisers.

The three chemical substances with which we are concerned in the ordinary chemical fertilisers, are Nitrogen, Phosphorus and Potash, each one of which performs a definite function in development of plant growth, and though they are to a certain extent interdependent in the exercise of these functions, to attempt to test one fertiliser against another *per se* is to find oneself in a fog of uncertainty as to how far the preponderance of any one of the constituents of any one mixture over the proportion of the same constituent in another mixture may have affected the results obtained.

In my tests, which I shall presently describe, I endeavoured to concentrate my attention on the behaviour of the Nitrogen element in the various mixtures I tested—I have been under a strong impression that other things being equal the accessibility of the Nitrogen to the plant was the most important factor to be examined. In this series of experiments I determined to leave the Phosphorus and Potash

contents of the mixtures out of my calculations by keeping them as constants. The variations I introduced all concerned *the form in which the Nitrogen was present, the amount* applied and its general availability. Some tests carried out a few years ago concerned the effect of varying the amount of Phosphorus used, and I do not propose to go into them on this occasion.

Nitrogen is present, broadly speaking, in one of two forms in the ordinary commercial formula and sometimes in *a combination of them both—in the Organic Blood Meal form or as an Inorganic Salt*, such as Ammonium Sulphate. Ammonium Phosphate and Ammonium and Potassium or Sodium nitrates.

There is a difference of considerable significance between the organic and the inorganic form. The organic form of Blood Meal does not consist of nitrogen containing salts in the ordinary soluble form as in the inorganic salts above-mentioned, but relies for the release of the Nitrogen contained in its constitution on complex reactions with organic and inorganic matter present in the soil and in the air—in fact, to determine the exact amount of available Nitrogen in Blood Meal is a very difficult matter. The commercial *figure of availability is usually put at 12 per cent. by weight*, but it is to a certain extent empirical, I believe. Furthermore, the published formulae do not state what proportion of inorganic nitrogen containing salts are blended with the Blood Meal in the mixture.

There is no doubt whatever that given ordinarily favourable conditions mixtures which rely for their Nitrogen availability partly on Blood Meal give excellent results with tobacco on most soils, and the Nitrogen is made available to the plant in a steady flow as it were through the growing period in a way which is much to be desired and these Blood Meal formulae have won their way to a popularity which has certainly been merited.

Before proceeding further it would be well to point out that the tests which I shall describe have all been carried out on a very typical sandveld soil—at an altitude of 4,700 feet, and I would hasten to add that I give such results as I have been able to obtain with the proviso that it is quite possible that they *may not* be found applicable to the heavier contact and diorite soils or at lower altitudes.

My first experiment was carried out to test whether Blood Meal mixtures with the same formulae but obtained from two different sources would furnish the similarity of results one would expect, and the results proved beyond question that the availability of Nitrogen to the plant varied very considerably—the growth in one instance being considerably more vigorous than the other. A plot of six acres of each formula was planted out on the 21st December, 1931, the amount of application 175 lbs. to the acre the same in each case, to see the difference in plant growth—both crops yielded well for our type of soil, taking into consideration a not too favourable incidence of rainfall, the weight per acre of the better crop was 725 lbs. per acre, and of the poorer 610. This result justified me in the opinion I have always had that the Nitrogen availability of Blood Meal was a somewhat uncertain factor—and I think it will be generally agreed that it is desirable as far as possible to eliminate all uncertain factors, if we are to get to anything like definite results and conclusions.

The next point in my investigation was to discover if possible what differences would be observed when the Blood Meal type of fertiliser was applied against the ordinary "complete" formula containing Nitrogen in the inorganic soluble form—to this end I planted a field of two plots of 5 acres each, using according to formulae exactly the same stated weights per acre of available nitrogen in each and this plot produced very interesting results. The actual application was 175 lbs. acre of Blood Meal, 150 lbs. acre double complete.

In this test it was very obvious that the "inorganic" formula suited the plant in the earlier stages better than the Blood Meal. The plants got away very much more rapidly, and, as one would expect, were of a darker colour and more robust. At the later stages of growth the Blood Meal treated plants undoubtedly showed a tendency to catch up, but this may be due to the unfavourable season—there was a distinct tendency to show more disease in the Blood Meal leaf than in the other, probably through the growth hanging fire in the earlier stages. The plants eventually reached approximately the same height, but the weight per acre was in favour of the inorganic form. Plot C Blood Meal 560 lbs. to the acre; Plot D, 620 lbs. to the acre.

I was next interested to try how the highly concentrated forms of fertiliser compared with the ordinary formulae. The advantages of the former lie, of course, in the saving of transport charges. One is faced with the fear of loss through excessive leaching and the possibility of the strong chemical mixture burning the roots and thus destroying the young plants. My tests, which were carried out on two plots of 7 acres each, showed conclusively that no disadvantages on these two counts need be feared.

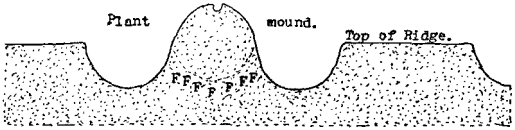
In this test a calculation was made to ensure that exactly the same amount of Nitrogen was available to the plants in both cases, the actual figures of the application being:—

(E) Highly concentrated	150
(F) Ordinary formula	215

The yield per acre of both plots was approximately the same, i.e., 630 lbs. to the acre.

It would perhaps be advantageous to describe here the method I used in the application of fertiliser to the test plots.

The land was first ridged in the ordinary way and then check rowed across the ridges, holes being made with the hoe about 8 inches deep. The fertiliser was then sprinkled round the base of these holes in a circle roughly a foot in diameter, and then thoroughly incorporated into the soil with a hoe (F). Finally a heap from 10 inches to 12 inches high



was drawn over the hole from the surrounding land and marked with a knob at the end of the hoe to indicate where the plant should be inserted—the ridge is drawn up just around the plant, but sufficient of the ridge remains between the plants to ensure good drainage in heavy rain. The fertiliser being well distributed there is little risk of burning of the roots nor is there any fear of leaching.

My final test, and perhaps the most interesting, consisted of 4 plots each 3 acres in extent, in which I compared Blood Meal, highly concentrated, double complete and Blood Meal with extra Superphosphates in the proportion of 2 Blood Meal, 1 Phosphate, using the same amount of Nitrogen in each case. Here, again, the results obtained agreed with those of the second test, inasmuch as the Blood Meal plants lagged behind until the very last and were not so vigorous in growth. The effect of the extra Phosphorus in the last test was a distinctly yellower appearance in the leaf and lightness in body.

As a result of the series of tests, I have established in my mind the fact that the readiness in the availability of the Nitrogen in the plant is the all important factor, and I feel that provided the ill effects of leaching are guarded against there is a distinct advantage to be obtained from the use of salts in which the Nitrogen is present in highly soluble form. I have an impression that there is no difference in the tendency of the plants to develop spot, though I am aware that there is a theory current in the minds of many that the so-called "complete" fertilisers have this defect.

There is no doubt that the prevalence of disease in the form of the different types of spot and white mould is the most serious menace we have to fight, and the whole matter is closely bound up with the conditions of plant growth. Everyone is aware that the liability of the plant to disease is affected by the way it is handled during the period of growth, the most critical stage being reached when the time for "topping" arrives. It has been my experience for a number of years that this process is carried out usually too soon. I have definitely proved to my own satisfaction, and I give it here for what it is worth, that the best time to top in an ordinary season is when practically the whole field has been in full bloom for at least a week, taking the flower head off only and leaving the small top leaves on the plant, and then, if the weather conditions promise a dry spell, subsequently to take off one or two of these top leaves a fortnight or so later, in fact, I invariably carry out the process of topping in two operations. Bearing in mind that the action of topping causes the uprush of "sap" which would otherwise be utilised in the formation and development of the seed to be absorbed by the leaf it is easy to understand that

the pressure of this stream so exerted causes the leaf to increase in body abnormally quickly, and suckers to emerge as an outlet for this pent up energy. The "skin" of the leaf, if so I may describe it, becomes subject to excessive tension, and just as a person who persistently over-eats himself will be likely to grow fat and to develop an unhealthy skin, so the leaf is distended and the skin is rendered extremely thin and liable to damage. A heavy rain will cause actual fracture, which may easily be seen under the microscope, and then when this is followed by hot sun and wind the fracture parts can be seen to have developed into "sores" as it were, and spot is likely to develop at once; for this reason I believe it is advisable to go very steadily, and by topping not too drastically, to ensure that this exertion of extra pressure in the leaf is made as gradual as possible—there is, however, one danger to guard against, and that is the development of mould or white rust. A plant if left untopped too long is very liable to this disease, and what we have to try and do is to "top" at such a period that reaping will be well on the way before mould has begun to develop; high priming is undoubtedly a preventive factor, as mould seems to develop always upwards from the bottom of the plants.

It may be said that considerable weight will be lost through late topping—the leaf not developing fully—but I incline to the view that this is a mistaken notion. It has been my experience that the leaf is of better texture, is not so coarse and certainly cures better if the plant is topped in the way I have indicated.

My reason for putting forward these suggestions on the process of topping is that the subject of plant growth has to be treated as a whole—and I incline to the view that though we may find the perfect fertiliser to produce the ideal development of the tobacco plant, unless the handling of the plant during the growing period is treated with judgment, our efforts are largely negatived—*the danger to be avoided is "topping" too soon;* in every case under my notice when this has been done the damage done by the inroads of spot has rendered the leaf nearly valueless, and I would say with some certainty it is better far to top too late and even too high than too early and too low.

If care be exercised to watch the growth of the plant, and especially the vigour of the growth, it is not a difficult matter so to govern the processes of topping and the removal of suckers in such a manner that the leaf never becomes overheavy and coarse for its type, and I think generally it will be found that the likelihood of the incidence of disease is very distinctly minimised.

In conclusion, I would like to say that the tests and experiments I have been describing have all been carried out with White Stem Orinoco, and that this type of tobacco seems to develop very good body under the conditions of topping and suckering I have described.

SOUTHERN RHODESIA WEATHER BUREAU.

JULY, 1932.

Barometric Pressure.—Pressure was normal for the month.

Temperature.—The maximum and minimum temperatures recorded during July were below normal, especially the minimum temperatures. Frosts were very prevalent during the month.

Rain.—Light showers fell in Lomagundi on the 5th and 6th, and a little drizzle was experienced in the south-eastern part of the country. Apart from this there was no rain.

JULY, 1932.

Station.	Pressure Millibars, 8.30 a.m.		Temperature in Stevenson Screen °F.								Rel. Hum.	Dew Point	Cloud Amt.	Precipitation.			Altitude (Feet).
			Absolute.		Mean.												
	Mean.	Normal.	Max.	Min.	Max.	Min.	½ Max. Min.	Normal.	Dry Bulb.	Wet Bulb.	%	F.	0-10	Ins.	Normal.	No. of Days.	
Bulawayo ...	873.7	873.6	74	32	68.1	40.7	54.4	56.9	54.1	44.7	45	34	1.3	..	0.1	...	4,436
Gwelo	867.1	...	73	29	67.6	39.4	53.5	55.6	52.8	45.3	55	37	1.7	...	...	...	4,632
Riverbank ...	...	...	81	29	73.9	40.5	57.2	58.7	50.7	43.7	56	36	...	...	...	...	4,100
Essexvale ...	...	...	86	27	77.0	35.2	56.1	57.1	43.8	39.6	68	34	..	...	0.1	...	3,828
Gwanda ...	912.2	...	79	29	71.3	38.4	54.9	...	54.3	45.8	50	37	1.5	...	0.1	...	3,235
Mazunga ...	...	...	86	31	76.0	40.0	58.0	61.2	56.6	49.2	59	43	1.3	...	0.1	...	1,970
Nuanetsi ...	...	...	85	31	76 7	39.2	58.0	..	55.4	48.2	59	42	2.4	...	0.3	...	1,630
Between Rivers	...	...	80	27	71.3	36.4	53.9	...	48.4	44.7	75	41	1.3	0.07	0.2	1	3,970
Enkeldoorn ...	...	...	74	32	67.9	41.1	54.5	56.1	54.7	47.1	55	39	2.5	...	0.1	...	4,720
Gatooma ...	...	...	78	32	72.7	39.2	56.0	59.1	55.6	48.8	61	43	1.9	...	...	...	3,850
Miami	854.5	..	76	37	70.2	43.4	56 8	...	56.1	49.5	62	43	0.9	0.08	...	1	4,090
Salisbury ...	859.3	859.8	75	32	69.3	40.8	55 1	56.3	55.5	47.9	57	41	2.2	...	...	...	4,890
Sinoia, Citrus ...	...	...	76	32	72.2	38.8	55.5	...	52.3	46.6	64	41	...	...	0.1	...	3,830
Sipolilo... ...	...	...	74	36	69.7	44.4	57 1	...	58.0	50.2	57	43	1.6	0.01	...	1	3,900
Mtoko	...	...	72	41	68.0	45.8	56.9	...	56.4	50.7	67	46	2.6	...	...	...	4,210
Shamva ...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	3,170
Angus Ranch ...	...	...	82	41	74.1	47.1	60.6	60.4	56.2	50.3	66	45	...	...	0.2	...	2,300
Craigendoran ...	...	...	80	31	73.9	42.0	58.0	...	61.4	53.7	60	48	...	...	0 2	..	3,430
New Year's Gift	...	...	80	42	72.9	47.3	60.1	...	55.5	49.4	65	44	...	0.01	0.2	1	2,700
Nyamasanga ...	...	...	72	53	67.3	41.3	54.3	...	57.5	46.8	52	40	...	...	...	...	5,080
Riverdene North	...	...	80	24	72.0	35.3	52.7	...	42.3	39 1	75	35	...	...	0.2	...	3,700
Stapleford ...	...	...	67	28	59.8	34.8	47.3	...	51.2	46.3	69	42	2.2	..	0.1	...	5,450
Umtali	898.4	898.4	78	38	69.0	44.7	56.9	58 4	57.4	50.8	62	44	1.8	...	0.3	...	3,677
Victoria ...	...	...	78	29	69.7	37.4	53.6	55.0	50.8	43.8	56	36	2 3	...	0.1	...	3,570
Melsetter ...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	0.8	..	5,060
Mount Selinda	...	...	76	38	67.3	44.7	56.0	...	58.5	51.3	61	45	0 8	0.07	1.0	2	3,520
Manchester ...	...	...	67	34	61.7	41.0	51.4	...	45.8	42.9	79	39	...	0.02	...	1	...

STUDIES ON THE IMPROVEMENT OF NATURAL VELD PASTURES.

No. 2

By A. D. Husband, F.I.C., and A. P. Taylor, M.A., B.Sc.,
Chemistry Branch, Department of Agriculture.

Note.—The following article was first printed in this Journal in February, 1931. *Owing to the constant demand it has been out of print for some time, and it is now reprinted by special request.—Editor.*

"Grass bears no blazonry of bloom to charm the senses with fragrance or splendour, but its homely hue is more enchanting than the lily or the rose. It yields no fruit in earth or air, yet should its harvest fail for a single year famine would depopulate the world."—*Farm Notes,* October, 1930.

The question of the conservation, management and possible improvement of natural pastures is of great importance to every agriculturist and stock breeder in Southern Rhodesia. In spite of the fact that in many areas of the country the quantity factor of the grazing appears ample, experience has taught stock breeders that high grade or pedigree cattle rapidly lose their productive capacity if left to graze on the veld without supplementary feeding. It is also recognised that even scrub stock in many parts of the country require supplementary mineral feeding in order to keep them in good health, and it is fully realised by the majority of farmers that there is apparently some deficiency in the natural grazing.

Chemical analysis of the veld herbage shows that the protein and mineral contents of the ordinary veld grasses are considerably lower than those of improved pastures in Europe, which is the type of grazing to which the imported

stock have been accustomed and which they require if they are to maintain their productivity.

It is a known fact that unless pastures in Europe receive proper management and manurial treatment they rapidly deteriorate, and it is also known that in certain cases sheep grazing on unmanured hill pastures are prone to suffer from certain diseases associated with dietetic deficiencies unless periodically driven down and allowed to graze on richer lowland pastures. These facts clearly demonstrate that only by careful methods of pasture management and attention to manurial treatment is it possible, even in Europe, to maintain the productivity of high-producing animals and to make stock-raising an economic proposition. It is very little wonder, therefore, in Africa, where practically no attention or consideration is given to the natural pastures, that these animals when placed upon the veld are found to lose their productive capacity. The probability that many of the difficulties connected with stock-raising experienced in this country may be due indirectly to faulty nutrition is evidenced by the great improvement in health resulting from the feeding of protein and mineral supplements to grazing animals in many parts of South Africa. The question as to whether it is more economic to feed the eminerals to the animals direct or to endeavour to influence the protein and mineral content of the grasses by application of mineral fertilisers to the soil has, however, received very little attention.

It is generally considered that fertilisation of natural veld pastures cannot be economic, although no experimental work to determine this has ever been carried out. It has been established quite definitely that fertilisation of arable land is economic, and it is difficult to understand, therefore, why fertilisation of grassland, at least in certain circumstances, should not also prove so. The fact that investigational work has already shown us that fertilisation of grassland not only increases the quantity, but also improves the quality, and hence is bound to reflect itself on the health and productive capacity of the animal, must be taken into consideration in studying the economics of the problem. In many cases the value of the cattle lost through so-called "poverty" would, had it been possible to keep them alive, have paid the cost of fertilisation of many acres of

grassland. The degree to which animals suffer from malnutrition on poor or deficient pastures is dependent mainly upon their rate of growth and productivity. Pastures suitable for small and slow-growing native stock may be entirely unsuitable for rapid-growing and high-producing grade or pedigree stock. Although it may not be economic to fertilise pastures for scrub cattle costing about £3 to £5 per head, it may be economic to fertilise for grade or pedigree beasts costing anything from £10 per head upwards.

The efforts of present-day stock breeders in Africa to evolve higher producing animals than the native stock make the problem of the improvement of the natural veld grasses one of extreme importance. Although in some cases it may be necessary and more practicable to feed minerals in the form of licks to the animals, it must not be forgotten that such methods exercise but little influence on the carrying capacity of the land and cannot be expected to correct or improve the palatability, digestibility or nutritive value of the grazing. All of these factors are influenced by treatment of the soil, and there is no question but that the best method of increasing the mineral intake of animals grazing on mineral-deficient pastures is to increase the mineral content of the grasses by enriching the soil. By this method the quantity factor is increased, the minerals are given in the form that will ensure the maximum assimilation by the animal, and at the same time the feeding value of the grass is increased in other ways.

In addition to the question of fertilisation, there is the all-important problem of methods of veld management. The practice of ranging cattle the whole year round may be suitable for native and scrub stock, but certainly is not suitable in most parts of the country for high grade stock. Recent research on pastures in Great Britain has demonstrated that the period of the maximum feeding value of a pasture can be controlled partially at least by methods of pasture management, and that this value varies according to the stage of maturity of the plant and the incidence of the rainfall. The results of a recent experiment carried out at the Salisbury Experiment Station show that the feeding value of the veld grass, as judged by chemical analysis, rapidly falls after the rains have ceased, and that one ton

of hay cut at the beginning of April is equal in food constituents to two tons cut in May.

This finding alone means that even on very poor pasture the cutting of the grass for hay at the correct time of the year results in a product having twice the protein content of the grass left standing on the veld. Were farmers to adopt this practice it would probably mean that their losses of stock from "poverty" would be reduced considerably and that in many cases grass having a minus feeding value would be converted into hay with one at least sufficient to supply maintenance.

Investigatory work into problems of veld management in Africa should produce results of great economic importance and should enable us to utilise to a far greater extent the potential food material contained in the vast areas of grazing land throughout the country.

In a previous paper published in the *Rhodesia Agricultural Journal* in September, 1928, reference was made to the fact that numerous experiments in other countries had shown that the feeding value of grass may vary considerably, according to its stage of maturity. It is a fact well recognised by farmers in Southern Rhodesia that at the beginning of the rainy season cattle grazing on the veld rapidly improve in condition, although the amount of young grass is limited, whereas at the end of the rains, although the quantity factor of the grazing is ample, cattle rapidly fall off in condition.

The system of pasture management known as "close-grazing," which has received so much attention from agricultural research workers in Europe, has demonstrated the high nutritive value of young grass as compared with mature grass and has shown that by a suitable system of rotational grazing the carrying capacity of pasture land may be considerably increased. In order to ascertain the difference in the feeding value of veld grass during each month of the year a series of analyses of the veld herbage has been carried out in the chemical laboratories on the same plots used for the experiment detailed in the report previously mentioned. In addition to these analyses it was decided to mark off several small areas on the plots which were to be cut regularly each month, with the object of simulating rotational

grazing, in order to demonstrate the difference between the nutritive value of the short young grass and the ungrazed and more mature grass.

It will be seen from the results detailed below that the probability suggested in the previous article—that the feeding value of our grasses is much lower during the latter part of the rainy season than during the early part—is borne out by the analysis of the grasses cut later on in the season.

The plots received no further manurial treatment after the season 1928-29 than that detailed in the article mentioned ("The Importance of Research on Pasture Improvement in Southern Rhodesia," *Rhodesia Agricultural Journal*, September, 1928). The last application of fertiliser was therefore given in November, 1928, and although it is not intended to stress the point in this further article, the residual effects are still noticeable, both in the quantity and the quality factors. Let it suffice to call particular attention to the former, with the undernoted figures.

TABLE I.

	1929 yield of hay per acre.	1930 yield of hay per acre.	Total yield per acre for 1929 and 1930.	Increase over control for 1929.	Increase over control for 1930.	Increase over control for 1929 and 1930.
	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.
Nitrate of soda + potash + super	3,492	2,600	6,092	2,084	1,386	3,470
Sulphate of ammonia + potash + super	2,900	2,166	5,066	1,492	952	2,444
Control (no fertiliser)	1,408	1,214	2,622	...	...	...

The figures showing the marked increase in bulk of hay as the result of one average application of fertiliser in two years require no comment, speaking as they do for themselves. It was originally intended to repeat cutting and weighing for at least one more year, but owing to

building requirements the ground is unfortunately no longer available.

Experimental Procedure.—The chemical analyses were again made on all three plots, but as our intention here is to demonstrate the value of close-grazing as compared with the usual method adopted of allowing the pasturage to mature, the tables below show only the results from the best of the three plots, that which received nitrate of soda. Equally as convincing and very similar contrasts were, however, obtained from the remaining two plots, but to avoid any possible confusion of the issue these are not reproduced.

Six yard-square quadrats were staked out, two on each area, and from these were obtained the samples of monthly cuttings for analysis. The cuttings were made by hand by means of a pair of shears on the 7th of each month, from 7th December, 1929, onwards. Previous to cutting, all weeds were removed, as observations have shown that stock graze these only slightly, and the grass was clipped as low as could conveniently be managed in order to simulate very close paddock grazing. It was well-nigh impossible to avoid including particles of grit and sand with the samples, so after air drying for several days the material was well shaken over a 3 mm. sieve and, all particles of extraneous matter having been removed, was ground to a powder in an electric grinder, bottled and analysed.

Simultaneously with these cuttings, corresponding ones were made alongside on the veld grass allowed to grow naturally, care being taken throughout that no two samples were ever obtained from the same spot. These samples were treated in every way similarly to the above, and represent ordinary ungrazed veld herbage. This part of the experiment was carried out throughout the complete period of twelve months, the last cutting taking place on 7th November, 1930. The close-grazing cuts had to be discontinued after that on 7th April, 1930, when, owing to the cessation of the rains and the consequent end of the growing season, there was insufficient material remaining for the purpose of analysis.

In the tables below all results are calculated as percentages on 100 per cent. dry matter.

TABLE II.

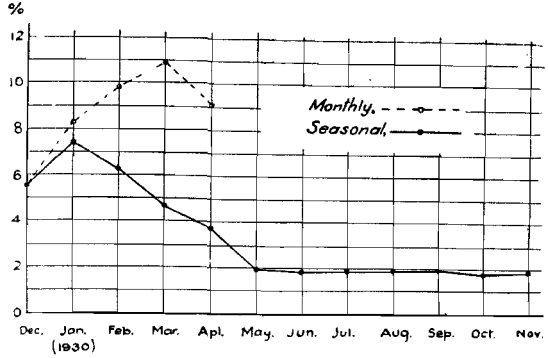
Composition of Grass of one month's growth only—corresponding to close-grazed veld.

Rainfall for preceding month.	Date of cutting.	Ash.	Acid-soluble ash.	Ether extract.	Fibre.	Nitrogen.	Crude protein.	True Protein.	Lime (CaO).	Phosphorus. (P_2O_5)	Chlorine (Cl).	Potash (K_2O)	Nutritive ratio.
Inches.		Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	
8.00	7.12.29	12.21	3.39	2.14	37.03	0.87	5.44	5.16	0.624	0.388	0.223	0.86	15.7
3.52	7.1.30	9.70	4.48	2.33	30.07	1.32	8.25	7.50	0.598	0.659	0.246	2.04	10.3
5.10	7.2.30	12.61	4.58	1.71	34.61	1.57	9.82	7.95	0.531	0.740	0.486	1.71	8.1
4.82	7.3.30	12.58	5.40	1.93	32.44	1.73	10.79	9.68	0.585	0.841	0.395	2.08	7.3
0.85	7.4.30	13.35	5.52	2.16	29.76	1.46	9.09	7.18	0.765	0.707	0.421	2.93	8.8

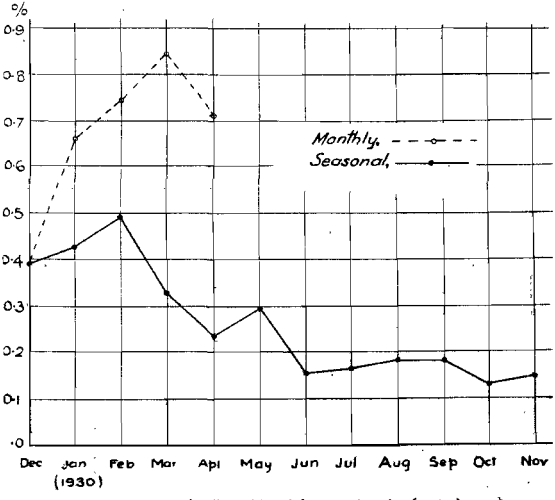
TABLE III.

Composition of Ungrazed Grass from month to month.

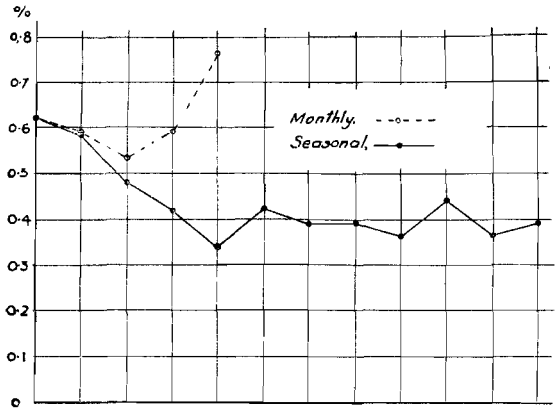
Rainfall for preceding month. Inches.	Date of cutting.	Ash. Per cent.	Acid-soluble ash. Per cent.	Ether extract. Per cent.	Fibre. Per cent.	Nitrogen. Per cent.	Crude protein. Per cent.	True protein. Per cent.	Lime (CaO). Per cent.	Phosphorus (P_2O_5) Per cent.	Chlorine (Cl) Per cent.	Potash (K_2O) Per cent.	Nutritive ratio
8.000	7.12.29	12.21	3.39	2.14	37.03	0.87	5.44	5.16	0.624	0.388	0.223	0.86	15.7
3.520	7. 1.30	10.93	4.61	2.17	32.23	1.18	7.40	6.07	0.591	0.425	0.375	1.92	11.4
5.100	7. 2.30	10.68	4.94	1.35	38.00	1.01	6.33	4.90	0.477	0.494	0.425	1.81	13.4
4.820	7. 3.30	8.13	3.80	1.34	43.61	0.76	4.73	3.44	0.421	0.328	0.248	1.53	18.8
0.850	7. 4.30	7.18	3.06	1.24	43.67	0.60	3.72	2.85	0.336	0.235	0.176	1.34	24.4
0.330	7. 5.30	6.57	2.35	1.86	42.71	0.31	1.95	1.82	0.422	0.297	0.154	0.88	48.2
...	7. 6.30	7.88	2.04	0.95	44.67	0.30	1.89	1.45	0.386	0.151	0.138	0.76	48.4
0.060	7. 7.30	7.29	2.04	1.13	44.31	0.31	1.92	1.47	0.392	0.162	0.110	0.77	48.0
...	7. 8.30	7.57	2.69	1.34	40.60	0.31	1.93	1.86	0.358	0.181	0.278	0.58	47.9
...	7. 9.30	8.50	3.11	1.07	42.49	0.32	1.99	1.89	0.435	0.181	0.170	0.79	45.4
0.125	7.10.30	7.25	2.09	0.98	43.70	0.28	1.73	0.93	0.365	0.126	0.119	0.41	53.4
...	7.11.30	7.34	2.07	0.68	42.21	0.29	1.84	1.06	0.392	0.147	0.093	0.46	50.0



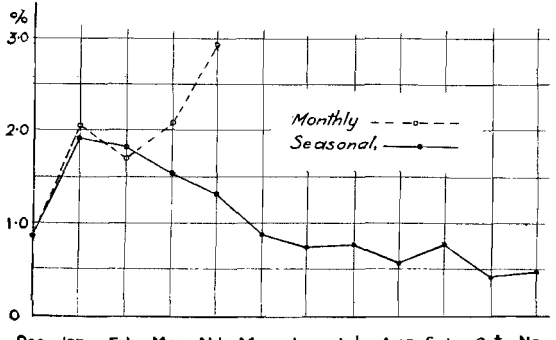
Graph I, Crude Protein



Graph II, Phosphoric Oxide (P_2O_5)



Graph III, Lime (CaO)



Graph IV, Potash (K_2O)

Analysis and Discussion of Data.—*Crude Protein.*—There are two striking points of interest with regard to this. The first is the lamentable one that in neither of the two series does the protein content at any time approach that of an average European grass. Cruickshank, in her studies into the seasonal variations of pastures, gives the figure of 20.8 per cent. for her "Good Pasture" and 10.9 per cent. for the "Poor Pasture." The highest result obtained by us, namely that for the monthly cut in February, 1930, was 10.79 per cent., a figure only exceeded in poverty by that of 8.37 per cent., which is the percentage content given in the records of the Rowett Institute for a sample taken from the Island of Lewis. Low though 10.79 per cent. is, however, compared with average European figures, it is almost 130 per cent. higher than the result obtained for the seasonal cut of the same date from the same plot, and 46 per cent. higher than the maximum for the year of the latter series, obtained from the January cutting, and this brings us to the second important point of interest.

Graph I. shows clearly the perceutage of crude protein of the monthly cut herbage to be very markedly higher throughout than that of the grass allowed to mature naturally. Striking though the graph is, the figures are even more so, for the maturing grass shows an average of 5.52 per cent. for the months December to April, whereas the grazed grass gives 8.68 per cent., an increase of 57 per cent. It may at this point be observed that the average crude protein content for the whole twelve months of the grass allowed to mature amounted to only 3.4 per cent., but the nature of the experiment did not permit of a direct comparison being made in this respect with the other series, except that, were our five months grazed samples distributed over the whole year, the average would be 3.6 per cent.

Phosphoric Oxide.—Whether there is any direct relationship between the seasonal variations of the contents of phosphoric oxide and of crude protein is a matter which will require, and which must receive, further investigation, but when Graph I. (crude protein) and Graph II. (phosphoric oxide) are compared, the similarity of the curves, as far as they go, is at once apparent. In the monthly cuttings in

each case a decided upward gradient occurs for three months, after which there is as distinctly a downward movement. In the seasonal samples, the same rise and fall is also evident in both, but here the crude protein reaches its apex after one month, whereas the culminating point for the phosphoric oxide is attained only after the second month has finished.

The results obtained for the phosphoric oxide content of the monthly samples are startling. The maximum is .841 per cent., obtained from the March sample, and this figure, apart from being the highest yet obtained from these plots, even when directly under the influence of fertilisation, is markedly higher than any one of those given in the Rowett Institute list already referred to, where the top figure is .74 per cent. from "cultivated pasture." It is 156 per cent. higher than the seasonal content of .328 per cent. for the same month, and 70 per cent. higher than the maximum seasonal content of .494 per cent. for the month of February. The average monthly content for the five months under review is .667 per cent., that of the seasonal cuts for the same period .374 per cent., a lead for the former of 79 per cent. The average for the year of the seasonal cuttings amounts to merely .259 per cent.

The exceedingly rapid drop from .297 per cent. in May to .151 per cent. in June, after which there is little variation, is due undoubtedly to the fact that most seeds containing a high percentage of phosphoric oxide have fallen to the ground in the intervening month, and so would not be contained, as previously, in the sample.

It is interesting to note that the young short grass shows no phosphorus deficiency, despite the relative phosphorus deficiency of the soil. In the more mature grass the phosphate content is certainly below that of pastures in Great Britain, but on the whole it cannot be stated that this pasture shows any marked deficiency of phosphorus until towards the end of the rainy season. One cannot, of course, state that on all pastures throughout the country the same relatively high phosphate content will exist, but taking European cultivated pastures as a standard, the pasture studied in this experiment shows a more marked relative deficiency of protein, potash and chlorine than of phosphorus.

Lime.—Graph III. shows the variations in the lime content. The monthly cuttings show a fairly rapid ascent in the contents of this constituent, commencing with the cutting on 7th February, after which date the rainfall began to decrease, and continuing to the comparatively high figure of .705 per cent. in April, when these observations ceased. Czapek (1920), quoted by Henrici, in a resumé of the literature on the subject, states that a continuous increase of the calcium takes place with the advancing season. Henrici, for veld grasses of the Eastern Transvaal high veld, found the accumulation of calcium in autumn and winter distinct in nearly all her grasses, but that the increase was nowhere as much as in Europe. Our plots showed no such increase; there was a steady fall of calcium in our seasonal cuts from December (.624 per cent.) until April (.336 per cent.), after which, with slight rises and falls, the figure remained on an average of .39 per cent. This, however, is quite comparable with Henrici's results for her Eastern Transvaal grasses, but considerably lower than what is normally obtained from good British pastures. The average for our five monthly cuts was .62 per cent.

Potash.—A reference to Graph IV. and the potash figure in Table III. shows that there is a marked deficiency in this constituent of our grasses as compared with cultivated pastures in Great Britain, which average 3.18 per cent. The average for the growing period of five months in ours is 1.92 per cent. for the monthly cuttings, and 1.49 per cent. for the seasonal cuts, the former rising to the excellent peak of almost 3 per cent. in April, when the rains have well-nigh ceased for the season, as against 1.34 per cent. for the latter. The average for the rest of the year in the mature grass stands, however, at the low figure of .66 per cent. Except for a small inexplicable rise in September, there is a steady decline in the seasonal samples from the maximum of 1.92 per cent., which was attained in the January cut, to the very low figure of .41 per cent. recorded in October.

Chlorine.—The chlorine figures vary throughout the year, the only points of interest being that each series of cuts shows its maximum in the February sample, after which there is a variable but steady decline throughout the

remainder of the year in the seasonal cuttings, whereas the monthly samples fell considerably in March, but rose slightly again in April. The content throughout is exceedingly low, compared with European natural pastures.

While the chlorine requirement of cattle is not at present known, it is probable that it is fairly high, owing to the fact that the chlorine is required by the animal in fairly large quantities for the production of hydrochloric acid in the stomach for digestive purposes. Even in Great Britain it is common practice to supply ordinary salt or rock salt to farm animals to satisfy a salt craving, and it is quite possible that the great craving of animals in this country for salty substances may be due to this deficiency of chlorine in our natural pastures.

Figures for sodium and magnesia are not given; the sodium content over all was found to be negligible, and the magnesia remained almost constant between .25 and .30 per cent.

Acid Soluble Ash.—This important estimation demonstrates probably more conclusively than any one of the others taken individually how the total soluble mineral content of the grass is improved by frequent grazing. Whereas there is a consistently steady increase from the first cutting until the end of the experiment in the monthly cuttings, there is as steady a decline in the other set, the result at the end of the year giving the remarkably low figure of 2.07 per cent. For June and July the total reached was only 2.04 per cent., comparing most unfavourably with 5.52 per cent. reached in the monthly cuts in April.

Ether Extract and Crude Fibre.—Little interest attaches to these. For the monthly cuts the ether extract remains constantly on the borders of 2 per cent., while in the other it descends almost uniformly from 2 per cent. to just below 1 per cent., finishing up in November with the low content of .68 per cent.

The crude fibre figures are on the whole higher than those obtained from the same plots for the two preceding years. This is evident in both sets of cuttings, but the monthly set at the end of its sampling had reduced its content to 29.8 per cent., whereas the seasonal had increased to 43.7 per cent.

This was, however, only what was to be expected, but it is a point of interest that right throughout both sets of cuttings, with the one exception of the last seasonal cut, the fibre has uniformly increased as the ether extract has decreased.

Nutritive Ratio.—The nutritive ratios are, of course, calculated on crude nutrients only. The results are self-proclaiming. Hay cut in February has a ratio of 1: 13.4, its aftermath one of 1: 7.3. Hay cut in April has one of 1: 24.4, while a month later in May it has widened to 1: 48.2.

The average ratio for the five monthly cuts is 1: 10, for the corresponding five seasonal cuts 1: 16.7, and for the whole year of the latter 1: 35.4.

From the above results, one is fairly justified in concluding that by a suitable system of veld management, including rotational grazing, the nutritive value and the carrying capacity of natural veld can be greatly enhanced. As one would naturally expect from research that has been carried out in other countries, it has been found that the feeding value of young grass in this country is very much higher than that of grass which is allowed to mature. Evidence is produced to show that the feeding value of our grasses is largely dependent on the stage of maturity, and not solely, as is generally supposed, upon the season of the year and the incidence of the rainfall. This indicates one or two direct lines upon which it may be possible, without the expenditure of a penny in fertiliser treatment, better to utilise the natural grazing of the veld.

The first line of attack would appear to be the controlling of the grazing lands by a system of paddocking and rotational grazing. It is true that this means additional expense in the matter of fencing, but such expense is unavoidable and would undoubtedly prove to be justified when distributed over a number of years. The size of the paddocks would naturally depend upon the number of cattle carried, and no definite standard can be laid down with regard to this.

The second important point brought out in the above experimental work is the necessity of cutting the hay at the correct stage of maturity in order to make the best use of it. It is quite clearly shown that there is a considerable difference in the feeding value of grass from month to month

during the growing season, and that the more the season advances the more rapidly the feeding value of the grass decreases.

From analytical data, it appears that the grass has its maximum feeding value during the month of January. The volume of grass during this month of the year would, however, hardly pay for its cutting. Although there is a fall in the protein content of the grass between January and February, yet during the month of February it has a very much higher feeding value than during the month of March. As its volume is quite good in February, it would appear that when the season permits, this would be the most profitable time in the Salisbury district to cut hay. Where it is possible to cut in this month, one could expect quite a reasonable aftermath, which would be very valuable for grazing purposes. This finding must not be taken as the best time for the whole of the country, it having been noted from the pasture research going on in Matabeleland that the most profitable time in that area is about one month earlier.

Although one realises how difficult it is for the average farmer to find the time and labour in the middle of the rainy season for the cutting of hay, the fact still remains that the extra effort in doing so during this month would be amply repaid by the value of the hay obtained as compared with hay cut later in the season.

The finding that the feeding value of our grass is largely dependent on its stage of maturity indicates that on farms where it is impracticable to cut grass for hay during the month of February, attempts should be made to check the growth of the grass by grazing during the early part of the growing season, say until some time in January, and then allowing the grass to go to hay after this date. It could then be cut later on during the season, probably in the month of April, and still have a high feeding value. It is true, of course, that by this latter method the yield of hay would be considerably reduced, but there is no doubt that this would be offset by its increased value.

The analysis of the mineral content of the grass under the two systems shows quite clearly that the percentage of

all the minerals is considerably higher in the grazed than in the ungrazed grass. The figures rather indicate that where such a system is practised there would be very little necessity to feed any minerals in the form of licks during the growing season. The high phosphate content of the short grass is a rather remarkable finding in view of the phosphate deficiency of our soils and the general belief of all stock breeders that it is necessary to feed to all animals right through the year some form of phosphatic mineral lick.

The question of the value of mineral fertilisation of the veld is being further studied at the pasture research stations both in Matabeleland and Mashonaland, and it is hoped that at a future date it will be possible to make some definite statement and recommendations regarding this aspect of veld improvement

SUMMARY.

From the results quoted and the analyses of these which have been made, the following points emerge:—

1. The bulk of hay obtained over a period of two years from a plot which received one normal dressing of complete fertiliser was 132 per cent. higher per acre than from a corresponding adjoining plot which received no fertiliser. In the latter plot the yield was just over 1¼ tons per acre; in the former it was just over 3 tons.

2. The crude protein content of the normal veld grass was found to be much below the standard of a natural average European grass. It was highest in January, with a total of 7.40 per cent., after which it rapidly declined to the miserable figure of 1.73 per cent.

3. Monthly clipped grass, intended to simulate close-grazing, gave much higher figures, rising to 10.79 per cent. crude protein at the beginning of March, and only falling to 9.09 per cent. in April, when the rains had virtually ceased.

4. The phosphatic content of the young grass, grazed monthly, was strikingly higher than that of the mature herbage. The former reached its summit in March with .841 per cent. phosphoric oxide, which is more than 2½ times the amount contained in the mature grass on the same date.

The phosphoric oxide in the mature grass was low throughout, decreasing rapidly after the dry season commenced.

5. The remaining mineral analyses indicate that our natural grasses suffer from a decided deficiency, but that this deficiency, though not so pronounced in the early part of the season, becomes extremely so in most instances from the month of March onwards.

Further, by a system of close-grazing, the total mineral content steadily increases up to at least the month of April.

6. Ether extract is consistently low and crude fibre very high, but the latter lowers steadily under a close-grazing practice.

7. The nutritive ratio of the mature herbage widens from 1: 11.4 at the height of the growing season in January to the appalling ratio of 1: 53.4 in October, the average from May to November being 1: 48.8.

On the other hand, the close-grazed quadrats show an average of 1: 10, the ratio narrowing to the useful one of 1: 7.3 in March.

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FARMING CALENDAR.

September.

BEE-KEEPING.

This is an important month for the bee-keeper, as it starts the first flow of the season. All hives that were sent into winter quarters on a double brood chamber, or otherwise with ample food for that period, should now be overflowing with young in all stages and with a population large enough to take full advantage of the flow. All hives should be carefully examined now and again, entrances opened out to suit the advancing warmth of the weather, and where necessary ventilator lids replaced on the top crates under the hive lid. See that no worry is caused to the bees by ants getting up, and that ample stores of good water (with a pinch of salt and a dash of vinegar) are available for drinking purposes, of which bees consume quite a lot. Swarms can now be looked for; if not required, they can best be destroyed by carbon bisulphide or calcium cyanide—both requiring very careful handling. If it is wanted to increase the apiary, as soon as the scouts are seen looking round for a home, get the decoy hive ready filled with dummy and proper frames of full foundation sheets, or, better still, if they are available, old drawn out brood combs, and as soon as it is taken possession of, insert if possible a frame or two of unsealed brood. As a rule the swarm will settle down at once. Such a colony is best placed in the apiary the same evening, if it can be so arranged. Do not make the mistake so often seen of supplying the new colony with starter frames only; give them full foundation sheets; it pays every time, and more especially so in the first early honey flow. Be sure also and protect the apiary against that persistent robber, the honey bear or ratel, by fencing it with fowl netting and pegging that down with wooden pegs every two feet. The two-footed robber can be just as effectively dealt with by placing a small light chain round the entire hive fastened with small staples and a padlock.

CITRUS FRUITS.

The fate of the citrus fruit crop is dependent upon the treatment the trees receive during this month. If the trees have been given the treatment recommended in the August calendar, and this treatment is followed by good irrigations and cultivation, a good crop of fruit may be expected, whereas a total failure will be the result if the trees suffer for want of moisture at this season of the year.

If not already done, all top worked trees should be headed back early in the month. This cutting back will induce the dormant buds (set in autumn) to commence growth. As the new shoots develop the old tops may be further shortened back until the old top is displaced with a new but profitable one.

The packing of late varieties must be speeded up and completed, if possible, by the end of the month, as the late picked fruit is likely to deteriorate in quality or come into competition with Mediterranean fruits.

All adventitious shoots (water shoots and suckers) must be cut off as they appear, and this work should be continued throughout the growing season.

CROPS.

Utilise your labour to the fullest extent for stumping and clearing more land for mixed crops and for general farm development. Do not be satisfied unless each year sees more profit-earning development work effected. Good organisation of the farm work will permit of much being done without great cost. Begin marking out holes for hand check-row planting of maize, and apply manure or fertiliser. Fertilisers which are to be broadcasted and ploughed or harrowed in can be applied. Do not forget that lands which have been green manured in March or April will require a second ploughing about this date or before being seeded to crops. Early varieties of winter cereals ripen this month and require harvesting. Danger from frost should be past now, and crops susceptible to frost, such as potatoes, onions in beds for the summer crop and Jerusalem artichokes, may be planted where lands are moist. Pumpkins and early maize may be planted on vlei lands. Edible canna may be planted "dry" during the latter half of this month, where some rains may be expected during next month. Overhaul all implements and replace worn parts. Putting this off till the planting season may mean serious loss of planting opportunities between rains. Get out the planters and seed drills. Overhaul and place them in proper working order. Ploughing and cross-ploughing should be hurried on with; also the ploughing under of farmyard manure. A spiked roller can usefully be employed for breaking down clods, particularly on those lands which are to be planted first. Make every effort to secure as good a seed-bed as possible; good seed-beds mean good stands, and good stands are all-important in securing good yields.

DAIRYING.

This is generally the quietest month of the year from a dairying standpoint. Most farmers have by this time exhausted their supplies of winter feed and the production of dairy products is consequently at its minimum. Town milk supplies are now falling off, and a greater use of purchased concentrates in the form of ground nut cake and bran is advisable to keep up the milk supply. Very little cheese is made during this month and stocks are naturally low. Old cheese should be cleared out of the storeroom before the advent of hot weather, and if possible should be sent to be storad under cold storage conditions. Considerable difficulty is to be expected in making butter during this month, as the early spring grass is shooting in the vleis and the butter is consequently very soft. To counteract this, greater use should be made of cotton seed cake, of which a small supply is expected to be available this season.

DECIDUOUS FRUITS.

Newly planted trees must not be permitted to become too dry; watering by hand or gravitation must be continued until the rains commence. Ten gallons of water every fourteen days is sufficient for young trees; these applications should be followed by the loosening of the soil to prevent undue evaporation of the added moisture.

All undesirable growths on the stem and in the centre of the trees should be suppressed as they appear; this will enable the retained shoots to develop normally.

Early fruits must be thinned out this month; only retain two or three fruits on each bearing twig or shoot. Those that are left will then develop into large and attractive fruits.

ENTOMOLOGICAL.

Cotton.—Prevention for most of the boll-worms will be the proper preparation of the ground, with thorough cultivation and eradication of all weeds on the land, particularly those of the family Hibiscus. Wild host plants for stainers should be sought out and destroyed.

Tobacco.—Young plants in seed-beds may suffer from cutworms. Frequent cultivation and laying down of poisoned bait—50 lbs. bran and

21 lbs. Paris green; bring to consistency of a stiff dough, adding water when necessary. Distribute this over the seed-beds in the forenoon, as the cutworm does most of its feeding at night. The beds should be thoroughly burnt over with wood or dry tobacco stalks to ensure that the seed-beds are free from cutworms, and baiting for any coming in from the surrounding ground should then be resorted to when the plants appear. Clear the ground for some distance round the beds, say 30 yards in all directions, and bait this ground thoroughly before sowing—this clearance allows a wide margin over which the cutworms would have to travel. Cutworms' moths are nocturnal in habit, so that the coverings of the beds need to be moth-proof at night; this should be seen to each evening.

Potato.—Early potatoes are liable to suffer from caterpillars. The crop should be sprayed at first sign of injury with an arsenical wash.

Cabbage.—During this month the most prominent enemies of plants of this family are diamond-back moth and web-worm. Cabbage louse is sometimes troublesome. The young plants may be sprayed or dusted with an arsenical compound for the former, and sprayed with tobacco wash and soap for the latter.

Beans.—Planted under irrigation during September usually escape serious infestation with stem maggot.

Citrus.—Throughout the month lime-sulphur spray (1-100) may be used to control yellow citrus thrip whilst on very young fruit. A useful spray against black aphis and thrip is the following:—Nicotine, 9 ozs.; Capex spreader, 7 ozs.; water, 100 gallons; Capex lime-sulphur, 1 gallon. This may be sprayed or fumigated against scale insects, having regard, however, to presence of fruit and blossom. Spraying and fumigating for scale should not be carried out whilst trees are in blossom. Clear young growth of aphis previous to blossoming, using nicotine, tobacco wash or Derris.

FLOWER GARDEN.

Cultivate extensively to prevent evaporation and to keep weeds in check. Water plants newly set out, especially such as have their roots near the surface. Thin and regulate growing shoots on roses and various shrubs. Plant out cannas and chrysanthemums (for massing and border decorations) and other herbaceous plants.

VEGETABLE GARDEN.

Sow French beans, leek, spinach, cucumber, egg plant, celery, rhubarb, melons and tomatoes. Small sowings of peas, turnips, beet, lettuce, radish, carrot, parsnip and cabbage may be made now.

FORESTRY.

All cuttings struck in sand in July and not yet transplanted into good soil should have this done as soon as possible. Preliminary sowings of eucalypt seeds should now be made on a small scale, so that transplants will be ready in case the first half of the rainy season should prove favourable; otherwise, bulk sowings should be postponed to October-November.

GENERAL.

Indigenous labour is apt to become more scarce at this time of the year, the boys returning to their kraals to break up the land for next season. Stock are liable to stray in search of the young grass now coming up, and much trouble from this cause is to be looked for on unfenced farms. Natives are now cultivating their gardens preparatory to sowing their crops, which they do much earlier than do Europeans. The mischief caused by veld burning becomes apparent from this time onwards in the condition of the stock, and it is necessary frequently to move them away in search of grazing.

POULTRY.

The supply of green food to the birds must be kept up; in fact, during the hot weather they require more.

During our dry season the available supply of such green foods as lettuces, cabbages, sunflower leaves is much reduced, but there are many others that can be used, such as belhambra, plumbago, wild cockscomb, plantain leaves, paw-paw leaves, etc. Sprouted oats, barley and wheat should also be used. Many of the young cockerels should now be fit for killing. Keep the best and get rid of the remainder. It is very advisable to caponise all young cockerels when about 2½ lbs. weight. The "Rhodesia Agricultural Journal" of October, 1924, and Bulletin No. 517 give clear and concise details as to the method of performing the operation. Some of the earliest hatched young pullets will show signs of commencing to lay now. No light breed bird should lay until it is 5 to 5½ months old, or a heavy breed until it is 6 to 6½ months old. Should any show signs of commencing to lay before this, they should be moved from run to run to prevent their doing so. A bird that lays before it is fully matured will stop growing, will always be small, and its eggs will for its first year of laying also be small.

When the pullets are four months old, i.e., those of the light breeds, they should be put into their permanent laying quarters, and those of the heavy breeds when they are five months old. A bird that is moved after it has started to lay will stop and very probably go into a moult.

See that young ducklings get plenty of shade during the hot weather. Those destined for killing should not be allowed free range or even a medium-sized run, but should be kept fairly crowded in small runs. It is necessary to get the flesh on them as quickly as possible, and the more rest and less exercise they have, the more rapid will be the growth, and also more succulent and tender the flesh.

The hatching of turkeys should proceed rapidly and be carried on until the end of the dry season. See that they have plenty of chopped onions or orion tops or eschalots, and thick separated milk. These are absolntely necessary if the turkey breeder wishes to be successful with his rearing. Do not give wet food; dry mash such as given to chickens is the better.

STOCK.

Cattle.—Ranching cattle should require little now in a normal season: it is only in the event of very late rains that trouble should be expected. Where possible, it will be wise to keep an eye on those cows that may be expected to calve early, with a view to feeding them if necessary and seeing that they do not get too poor. The supplementary feeding of ranch stock is always a difficult problem. But a small provision of cotton seed, good veld hay, kaffir corn or sunflower silage at this time may be the means of saving many head of cattle when the rains are late. This is a critical month for young stock. Weaning should be completed as soon as conditions permit. The dairyman will carry on much as in August; he will, however, use his discretion (in accordance with the condition of his veld) as to the use of ensilage, pumpkins or other bulky and succulent food. He will be wise not to shorten the supply of concentrated foods for some time to come. A little hay or ensilage should still be kept in reserve until the rains have fallen in reasonable abundance. The object should be to build up the condition of the cows expected to calve when the rains come.

Sheep.—The remarks for August apply. Feed up and shear the rams ready for mating for winter lambs.

TOBACCO.

Hasten the preparation of seed-beds for flue cured type of tobacco. The first batch of beds should be seeded about mid-September; subsequent

seeding of the remaining seed-beds should be done (in batches) at fortnightly intervals. The last lot of beds normally is sown by the end of October. Seed-beds for dark fire cured type of tobacco should be prepared for seeding which commences after the first week in October.

VETERINARY.

There should be very few deaths from redwater and gallsickness this month. Cases of vegetable poisoning of stock picking up tempting young green shoots of dangerous character on the burnt veld are of frequent occurrence. Sheep can be inoculated against blue tongue, but ewes in lamb should not be treated, on account of the danger of abortion. Scab may be prevalent.

WEATHER.

The temperature may be expected to rise steadily during this month. Rains are not due until next month, though the average over a period of years shows slightly more than in the previous four months, and ranges between .1 and .5 inch. Frost has been known to occur in September, although this is a very unusual event. Rain-gauges should be seen to before the rains commence. They should be carefully adjusted to stand exactly level with the lip four feet above ground, and care should be taken that no tree, building or other obstruction interferes with the fair precipitation of rain into the orifice.

October.

BEE-KEEPING.

Bush bloom is now on, the queens consequently are laying vigorously, therefore give space and ventilation. In good districts, where stocks are strong, nectar may be coming in freely, and to prevent swarming it may be necessary to remove a crate of honey. By using the carbolic cloth, the operation is easily and quickly accomplished. At this season, whenever a crate of honey is removed, a properly fitted empty crate must take its place, otherwise the bees will swarm. Keep the apiary clear of weeds, and all hives well shaded. Feed any weak stocks.

CITRUS FRUITS.

Citrus trees should not be permitted to suffer for want of water if a good setting of fruit is desired. Continue irrigation at fairly frequent intervals, especially if it is windy. Cultivation must follow each irrigation when the soil is fit to work, otherwise a large amount of moisture will be lost by evaporation. The packing of late fruit for export should be completed early in the month or before the rains commence. If rains intervene, the carrying properties will be affected and the fruit will probably break down in transit. Suppress all stem growths or water shoots as they appear. Young trees planted last season may with advantage have the stems whitewashed or washed with Bordeaux mixture paste; this will prevent undue sun-scalding of the unprotected stems. Plant cover crops with the first good rains.

CROPS.

If not already attended to, overhaul all farming implements and replace worn parts to ensure efficiency. Shell ground nuts required for the season's planting. Ploughing of old lands should, at latest, be finished this month. If seed potatoes will not keep in good condition until next month, they may be planted now, but later planting is better. Edible

canna may be planted this month before rain falls. Also velvet beans, dolichos beans and sunn hemp towards the end of the month for green manuring. Harvest winter cereals and plough under the stubbles as soon as possible after harvest. When rains have fallen, use every effort to *improve the tilth of the lands which will be the first to be planted.* On cloddy lands already ploughed, seize the opportunity to break down the clods by disc and drag harrowing as showers of rain fall. A spiked roller is very useful for this work. A good tilth means good planting, and a *good stand of maize; therefore, do everything possible by cross* ploughing, disc and drag harrowing to bring the soil into good condition for seeding.

When necessary, keep the harrows going to check early weed growth. Clean lands at this time of year are an insurance against cutworm and other insect pests. If weather conditions permit, plant a trap crop of *maize to attract the stalk borer.* New land to be ploughed and intended for planting this season should be cleared of heavy grass or weeds by burning or cutting to ensure good work being done by the ploughs. Seasonal showers of rain are liable to spoil bricks unburned. See that *bricks which have been made are protected from rain.* Clean out guttering and down-spouts of house and farm buildings. Press on with development work so as to have this completed before rains break.

DAIRYING.

During the month of October and until such time as the rains have commenced and green grazing is available, dairy stock require to be almost entirely stall fed. Cows in milk and cows due to calve should be liberally fed on succulents and concentrates in order that they may com*mence the dairying season in good condition, and make full use of the* early grazing for milk production. Dairy cows that are underfed at this time of the year invariably produce milk of poor quality, and usually throw weedy undersized calves; furthermore, they do not pick up in condition until comparatively late in the season.

During October, the cow's ration should consist of succulents such as *silage or green feed, etc., legume hay of good quality and a liberal* allowance of concentrates; a pound or so of a feed such as ground-nut cake is invaluable for dairy stock at this time of the year.

Weather conditions are generally fairly warm during the month of October, and every precaution should be taken to keep the cream, which *is used for butter-making or which is sent to the creamery, as cool as* possible. The can or bucket containing the cream should be placed in a basin of water or concrete trough, in the dairy, and exposed to a draught; a piece of kaffir blanket, which dips into the water, should be wrapped around the can or bucket containing the cream. Churning of *cream for butter-making is best carried out early in the morning*— before sunrise if possible; the coolest water obtainable should be used for washing the butter whilst in the granular stage.

At this season of the year cheese-makers may find that the milk is deficient in butter fat; this is generally the result of under-feeding or unsuitable feeding. Cheese made from milk of low fat content is invariably dry and hard, defects that are accentuated by over cooking the curd or by cooking at too high a temperature. The curd should be firmed in the whey at a temperature not higher than 98° F. to 100° F.

DECIDUOUS FRUITS.

Keep all trees well watered until the rains commence; cultivate after each watering to prevent evaporation of added moisture. Rub off all undesirable shoots, such as those arising on the main stem near the ground; also those shoots having a tendency to crowd each other. Two or more shoots should not be allowed to develop from the same spot on any part of the tree. Rub off the weaker ones soon after they appear. The fruit of early peach trees should be thinned out if a heavy crop has

set; this thinning will result in a crop of large-sized fruit. All fruit should be thinned out if necessary.

ENTOMOLOGICAL.

Maize.—Where circumstances permit early growth of maize, crops planted late in October are liable to suffer in December from stalk-borer, especially if only a few acres are involved. If maize can be planted early in October, the plants are usually large enough by December to outgrow serious damage. Maize beetle is now in its pupal stage. Thorough working and smashing up of the soil at this time will destroy great numbers.

Tobacco.—See notes for last month, together with article in the "Rhodesia Agricultural Journal" for October, 1926, on "Baiting of Tobacco Seed Beds with Cyanogas Calcium Cyanide." The lands must be kept free from all weeds which caterpillars may feed on, and it is well not to have maize, tomato and Cape gooseberries near the lands; a clearing of some depth is advisable, which must be regularly weeded. If *poisoned bait is put down, it has been found that a covering of sacking* or leaves will help to retain moisture and thus give further attraction, especially at this time of the year. In order to lessen the heavy infestation of caterpillars and other insect pests in the seed beds, coverings of hessian or cheese cloth should be kept over beds, especially at night; cutworm moths are nocturnal in habit, so that the coverings of the beds need to be moth-proof at night. Notwithstanding precautions in the covering of the beds, insects will enter, and after the emergence of the seedlings a weekly spraying should be carried out. Lead arsenate at the rate of 1½ ozs. (powder) or 3 ozs. (paste) in a 4-gallon petrol tin can be sprayed on the plants once a week to keep insect pests in check. Lead arsenate can be safely used with Bordeaux mixture, the constituents not reacting upon one another. The two combined sprays act as a preventative and deterrent to insect and fungoid troubles.

Cotton.—Thorough cultivation and keeping down of weeds should be resorted to in order to lessen the infestation of over-wintering pupæ, by exposure to the sun, and birds.

Potato.—Avoid introducing root gallworm and potato diseases to valuable land under irrigation or to the home garden with seed potatoes. Growing plants in October may be defoliated by caterpillars, or the tops severely injured by the potato tuber moth. Spray with arsenate of lead (powder), 1 lb. to 30 gallons of water; or (paste), 1 lb. to 16 gallons of water.

Cabbage, Turnip, etc., are apt to suffer severely from diamond back moth and webworm. Dust regularly with Paris green, 1 lb.; fresh water-slaked lime, 20 lbs. For cabbage aphis, water liberally, and wash plants regularly with a forceful stream of water from a hose or spray pump.

Beans and Peas are little attacked by insects at this time of year. If aphis (green fly) is troublesome, the plants may be sprayed with soap wash or tobacco wash. Leaf-eating beetles are best destroyed by hand.

Cucumbers, Marrows, etc., may be attacked by leaf-eating beetles, which quickly destroy the young plants. The young plants may be protected by gauze covers. Once vigorous growth has started, the damage is negligible.

Citrus.—All out-of-season fruit should be removed by this time. Destroy all fruit "struck" by the false codling moth. Aphis may be controlled by *very careful spraying with the combined "Lime-Sulphur-Nicotine" spray* (for details see "Rhodesia Agricultural Journal," Sept., 1926, page 871), while the yellow thrip may also be kept in check by this spray. Avoid using miscible oils for citrus spraying. A careful search should be made for the American bollworm ("Heliothis obsoleta").

Deciduous Fruit Trees, including grape vines, are liable to attack by chafer beetles. Heavy spraying with lead arsenate (paste), 1 lb. to 16

gallons of water, or (powder), 1 lb. to 20 gallons, appears to afford considerable protection, but the leaves need thoroughly coating.

Fig.—Fruit infested with fig weevil should be collected regularly and destroyed.

FLOWER GARDEN.

All flower seeds, annual and perennial, may be sown as in September. A word or two on open seed beds may not be out of place here. These beds should be prepared in a sheltered position, and the soil should be well and deeply dug. This is most essential, as in this state the soil when once watered is more easily kept moist, and is not so liable to cake. The top dressing should be free from all undecayed vegetable matter, and when sown, the seeds should be covered with a thin dressing of fine light soil, over which a thin covering of grass may be placed to check evaporation. Transplanting from boxes or beds should be done on a dull day or towards evening; the plants should be well watered before being removed, and the roots disturbed as little as possible, care being taken that the latter have their full depth and spread when planting.

VEGETABLE GARDEN.

As in September, nearly all vegetable seeds may be sown. Early potatoes should be earthed up when reaching the height of about eight inches. In planting a small amount of marrow, melon, cucumber, and pumpkin, the writer has found it economical to sow the seed one in a tin and transplant when about four inches high in hills. A few cucumbers planted in this manner yielded nearly 400 a week for about two months. Sweet corn and maize may also be sown this month.

FORESTRY.

The main sowings of Eucalypt (gum) seed should be made either in seed trays or in well prepared seed beds. A well-broken soil forming a fine tilth in the seed bed ensures more successful germination and better plants. If transplants are being used, any seedlings which are ready should be pricked out.

Seedlings in open beds may have their tap roots cut so as to develop fibrous lateral roots, and thus produce good type stocky plants. Remember the plant feeds through its roots, hence the better the root system, the healthier the plant and the greater its chances of successful establishment. If conditions are favourable, cross-plough and harrow land for planting broken up in early autumn.

POULTRY.

October is usually a hot month, and poultry keepers should therefore see that their birds have access to shade during the day. At the same time they should have plenty of air. One often sees birds during hot weather sitting under dense bushes, which is almost worse than no shade at all.

All houses should be examined and, if necessary, repaired. It is advisable to repeat the caution that birds must have dry quarters.

Many poultry keepers do not realise the vital necessity of giving their birds especially the young stock, plenty of succulent green food during the hot weather. It should be cut up and placed in boxes or hoppers about 7.30 a.m. and 5 p.m., and, if very hot, also at noon; it should never be placed in the sun. As much as the birds will eat should be supplied. Lack of it, especially during hot weather, causes a reduced output of eggs, smaller eggs and light-coloured yolks; further, a disease known as "nutritional disease" is likely to affect the birds and cause deaths. The symptoms are much like those of eye roup, without the well-known offensive smell of roup. It is due to the fact that vitamine A, which is present in large amounts in all succulent green foods, and which is so necessary for nutrition, is lacking. There is no doubt that many chickens and fowls die each year from this cause.

Ducks.—These during the hot weather require even more shade than do fowls; they cannot stand the direct rays of the sun nor sultry heat. The houses should always have dry floors, and should be overhauled before the rains commence. Ducks sleeping on damp floors often contract rheumatism and cramp. The floor of the duck house should be raised a few inches, thus ensuring a dry bed.

As many ducklings should be hatched as possible now, provided, of course, there is the prospect of a sale for them at ten weeks old. They thrive best in the wet weather.

Turkeys.—Stop hatching until after the wet season is over. To rear turkeys in the wet weather entails a good deal of time, labour, expense and often losses. Once a young turkey chick gets wet, it will probably die; at any rate it will never be the same bird it would have been had it not got wet. Give the older turkeys all the range possible; the further afield they go, the better grown birds they become, and less is the expense of feeding. See also that their roosting quarters are water-tight before the rains commence.

STOCK.

Cattle.—Ranching cattle on granite veld will in many instances be in fairly good condition on account of the early grass in the vleis, etc. On the diorite soils and later veld the cattle owner will still have to watch his weaker cattle carefully. In any case all supplies of hay, ensilage, majordas, etc., should be carefully husbanded in anticipation of possible late rains, but at the same time every effort should be made to prevent cattle becoming weak. Dairymen will need to feed highly both with succulents and green foods. Calves should be weaned and branded if this has not already been done, and care should be taken that they do not suffer any serious setback by reason of want of feed. The question of a mineral mixture should receive consideration.

Sheep.—If spring lambs are expected, one should see that the sheep-shed is in order, and that there is a supply of hay, ensilage or mealies for the poorer ewes in the event of late rains. All drinking places should be cleaned out, and care taken that the water supply is sufficient. Ewes for winter lambing should be well looked after, so as to get them up in condition before they are put to the ram next month. General shearing may start, including the April-May lambs.

TOBACCO.

Continue to sow seed beds. Where grass has been put on the seed beds to assist germination of seed a daily inspection should be made, and as soon as the first few plants make their appearance the grass should be raised up a little from the bed in order to prevent the plants growing "spindley." All possible preparation for the coming planting season should be made.

VETERINARY.

White scour is prevalent in spring—November and December—but dipping is eradicating this disease. There is still danger from vegetable poisoning, *and it will only disappear when there is plenty of good grass on* the veld.

WEATHER.

This is apt to be a hot, dry month, and rather trying, therefore, to man and beast, and the strong winds which blow at this season add to the general discomfort. Evaporation is, as a consequence, at its greatest at this time of year, and dams and pools lose most from this cause. The prevalence of veld fires at this time of year adds to the anxiety of the stock owner.

The rainy season has occasionally started early in October, but for practical purposes it need not be expected before the end of this month. The days are becoming warmer, and often even hot and oppressive. Clouds gradually collect, at first disappearing at sunset, but later becoming more persistent. Sheet lightning is usually frequent, and showers of gradually

increasing severity mark that the rainy season has set in. Steps should be taken in advance to provide for the run-off after such torrential rains, *otherwise serious loss may result.*

The normal rainfall varies from three-quarters of an inch to an inch in the different portions of the country. The rain usually occurs in the form of thunder-showers, which are not long sustained and are fairly local, but the total rainfall experienced during the month does not vary much over the whole country, with the exception of the eastern border, where the rainfall is usually heavier.

SOUTHERN RHODESIA VETERINARY REPORT.

June, 1932.

AFRICAN COAST FEVER.

MELSETTER DISTRICT.

Commonage.—One case of disease occurred. All cattle were moved to clean veld on the south-western section of the Commonage.

Sawerombi.—No further cases.

Orange Grove.—On 14th June one case of Coast Fever was diagnosed in the herd running on this farm. This was the first case of disease amongst these cattle, although they had been grazing in the vicinity of the infected Roede herd and dipped at the same tank on Orange Grove Annexe. On the 21st the herd was moved to a temperature camp on Welgelegen.

Rocklands Estate.—The process of moving the infected herds through temperature camps to clean veld was continued. The total mortality from Coast Fever during the month was 315 head.

To test a common belief that inoculation with bile was a "cure" for coast fever 21 head were treated: all died.

Laughing Waters.—Twenty-one days after the removal of this herd to what was considered clean veld one beast showed a high temperature with Kochs bodies in gland smears, indicating that the veld was infected. Arrangements were made for a further removal and temperaturing.

Newcastle.—The temperaturing of the herds on clean veld was completed. No cases suspicious of coast fever were detected.

Glencoe.—No further cases.

FOOT AND MOUTH DISEASE.

Gwelo Veterinary District.

The inoculation of all cattle on Ghoko Block was completed on 7th June.

A fresh outbreak occurred on the farm Pender adjoining Ghoko Block, and the herd was inoculated immediately.

The cattle concentrated on Aberfoyle Block for inoculation were permitted to return to their respective farms and kraals.

Umvuma Veterinary District.

No fresh outbreaks. It was decided to inoculate all cattle on the Central Estates and operations were started on 27th June.

Victoria Veterinary District.

No fresh infection occurred during the month.

After the outbreak in the weaner mobs at Headquarters Section, Nuanetsi Ranch, referred to in the report for May, it was decided to inoculate all these mobs in order to get the infection through as quickly as possible and a supply of blood was obtained from the Gwanda area. The following results were observed: In one mob about 30 reacted with visible lesions, and in another 6 showed visible lesions. In the latter 16 calves ranging in age from 2 days to 2 months were temperatured morning and evening, but no thermal reaction was observed. No reactions occurred in the other mobs.

In order to obtain some information about the degree of immunity conferred by the local type of foot and mouth disease 266 transport oxen, which had passed through the original infection in April and May, 1931, were inoculated, and of these 36 head were temperatured morning and evening. In no single instance was any symptom, thermal or otherwise, of foot and mouth disease observed. There can be no doubt as to the virulence of the blood used as the same mixture caused a very high percentage of reactions in clean herds in the area of origin.

Bulawayo Veterinary District.

In the Belingwe district all previously infected areas have cleared up completely.

In the Gwanda district the cattle concentrated at Oncerbrook and Ladi, having recovered from inoculation, were permitted to return to their kraals.

In the Insiza district the inoculation of cattle at Tshadas tank in the Insiza Reserve and in the Siwazi dipping tank area was completed. An inoculation station was established on Donkerhoek and the remainder of the Donkerhoek cattle, together with cattle moved from River Block, Nyamini and Buffelsfontein were inoculated there. Cattle free belts with strong cordons have been established around all the infected areas. In the eastern section of the Insiza district infection was found on the farm Virginia, due, it was believed, to an illicit movement of cattle from the infected area in Selukwe district. A few kraals in Luttrells Town North and De Beer's Native Location were also found to be infected. A cattle free belt was established around De Beer's Location and Luttrells Town North and all cattle involved concentrated and inoculated.

Since the policy of concentrating and inoculating cattle with the object of limiting the spread of infection the total number of animals so dealt with in this veterinary district is 65,959.

TRYPANOSOMIASIS.

A few cases occurred in the Darwin district and also in the Melsetter district.

HORSESICKNESS.

Only one case reported.

IMPORTATIONS.

From the Union of South Africa and Bechuanaland Protectorate: Bulls 1, heifers 51, oxen 205, cows 142, horses 36, sheep 1,811, goats 215, pigs 46.

EXPORTATIONS.

Nil.

J. M. SINCLAIR,
Chief Veterinary Surgeon.

PRICE LIST OF FOREST-TREE TRANSPLANTS, ORNAMENTAL TREES AND SHRUBS, HEDGE PLANTS, CREEPERS AND SEEDS,

OBTAINABLE AT THE GOVERNMENT FOREST NURSERY, SALISBURY.

1. Transplants of forest trees, etc., as far as in stock, are obtainable at the subjoined rates.

2. Orders should be addressed to the Chief, Division of Forestry, Salisbury; or Manager, Forest Nursery, Salisbury.

3. **All orders must be accompanied by a remittance in cash, bank note, postal order, draft or cheque, made payable to the Department of Agriculture, Salisbury. Under no circumstances will plants or seeds be sent out or taken away from the Nurseries unless paid for.**

4. All transplants are despatched at Rate 10 on railways at purchaser's risk. The transplants are watered as far as this is possible by the railway staff.

5. All prices quoted are for delivery free at any station or siding in Southern Rhodesia.

6. Purchasers of trees contained in tins either of 25 or 4 trees are requested to return the tins, carriage forward, to the nursery from which they were obtained, or to the Manager, Forest Nursery, Salisbury. If the tins are not returned within two months from date of issue, they will be charged for at the current rate of petrol tins; present price, 4d. each.

7. No trees will be reserved unless specially booked. Orders will be executed in order of receipt as trees are ready for despatch. Every effort will be made to comply with instructions of purchasers.

8. Transplants of forest trees, when quoted at per 1,000, are grown in half paraffin or petrol tins containing 20 to 25 transplants. The average weight of each tin is about 25 lbs. Height of transplants, about 3 to 12 inches.

9. Transplants of larger size, from 1 ft. to 3 ft., are also supplied four in a tin at per tree. Weight of tin, about 25 lbs.

10. Shrubs and ornamental plants in single tins have a weight of about 5 lbs.

11. To purchasers of forest trees, the following reductions are made:—

(a) When the number exceeds 1,000, the price is £3 5s. per 1,000.

(b) When the number exceeds 5,000, the price is £2 14s. per 1,000.

(c) Special quotation for orders over 20,000.

12. Orders for seed are posted or railed free of charge.

13. Though every care is taken to supply trees and seeds true to name and of good quality, no guarantee can be given in this respect, more particularly in regard to seed.

14. Intending tree planters are invited to apply to the Chief, Division of Forestry, Salisbury, for advice as to the most suitable trees for growing in the various climates and soils of the Colony, and on the best methods to adopt in the formation of plantations, wind breaks and shelter belts.

15. No responsibility taken after trees, shrubs, etc., have been accepted by the Railways. Any claim for loss or death should be made to the Railway Company.

Price of Transplants.—For convenience, the following symbols are used to indicate the purchase prices of transplants:—

A—Trees, 25 in tin, at 2s. 3d. per tin, £3 5s. per 1,000; £2 14s. per 1,000 for orders over 5,000.

B—Trees and shrubs, 24 in tin, at 3d. each.

C—Trees and shrubs, 4 in tin, at 4d. each.

D—Trees and shrubs, 4 in tin, at 9d. each.

E—Trees and shrubs at 9d. each; extra large up to 5s.

Botanical Name.	Common Name.	Remarks.	Price of transplants.	Price of seed. Lb.	Oz.
Callitris calcarata	Black cypress pine ...	Usually rather slow growing, but reaches a fair size and produces a valuable durable softwood. Suited for dry country planting, especially in sandy soil. Resistant to white ants. Good shelter for orchards, etc.	A. C.	15s.	1s.
Callitris robusta	White cypress pine ...	Similar to Callitris calcarata. Better for poor acid soils and ironstone kopjes.	A. C.	15s.	1s.
Casuarina Cunninghamiana	Beefwood	A fine large shade tree, suitable for avenues and narrow belts, but not recommended for timber plantations. Requires deep soil in drier localities. The foliage is useful for stock fodder, and the tree stands lopping well.	A. C.	...	2s. pkt. 1s.
Cedrela odorata		A rapid-growing tree similar to Cedrela toona, but with lighter foliage. Likely to do well on heavy soils, fairly free from frost. 30 to 40 feet in height.	A.		
Cedrela toona	Toona tree	A rapid-growing, handsome, semi-deciduous tree, suited for moister localities where frost is slight. Yields a valuable soft timber. Recommended for plantations, as well as shade and ornament.	A. C.	15s.	1s.
Cupressus arizonica ...	Arizona cypress	A hardy evergreen tree, suitable for dry localities, but requiring a well-drained and rather deep soil. Useful for shelter belts and also for hedges when closely planted.	A. C.	15s.	1s.
Cupressus lusitanica ...	Portuguese cypress ...	A fast-growing cypress, producing an excellent softwood timber, but requires a moist, cool climate and a good soil. May well be used for shelter and hedges in favourable localities.	A. C.	5s.	6d.
Cupressus sempervirens, var. horizontalis	Common spreading cypress	A hardy cypress, suited for limestone as well as other soils. Not so frost or drought hardy as Cupressus arizonica. Suitable for shelter and hedges.	A. C.	15s.	1s.

Botanical Name.	Common Name.	Remarks.	Price of trans-plants.	Price of seed. Lb.	Oz.
Cupressus sempervirens, var. pyramidalis	Common upright cypress	An ornamental tree for gardens and cemeteries. Also useful as a shelter tree. Grows under similar conditions to the "var. horizontalis."	A. C.	15s.	1s.
Cupressus torulosa ...	Himalayan cypress ...	A good tree for timber and shelter. Withstands much cold and drought. Not very soil exacting. Fairly frost-hardy.	A. C.	10s.	9d.
Eucalyptus botryoides	Bangalay	A large-leaved, heavy-foliaged gum. Quick growing. Suitable for granite and red soils. Withstands frosts, but not very drought-resistant.	A.	15s.	1s.
Eucalyptus citriodora ...	Lemon-scented gum ...	A clean-boled tree, producing an excellent timber. Leaves lemon-scented. Suited for wetter regions and on the better soils in the lower rainfall regions. Will not withstand much frost or drought. Flowers prolifically, rendering it very useful for honey production.	A.	15s.	1s.
Eucalyptus crebra	Narrow-leaved iron-bark	A slow-growing, deep-rooting species, producing excellent timber. Suitable for well-drained soils in the higher rainfall areas. Withstands a certain amount of drought and light frosts. Will not thrive in an acid soil.	A.	15s.	1s.
Eucalyptus globulus ...	Tasmanian blue gum	A fast-growing tree, suitable for cool, moist areas with deep soils. Will not withstand drought, but is frost-resistant to a large extent. Produces a useful timber.	A.	15s.	1s.
Eucalyptus maculata ...	Spotted gum	One of the best trees for timber production or shelter in the wetter areas, being fairly hardy to drought but not to frost. Produces an excellent timber.	A.	15s.	1s.

Eucalyptus maideni ...	Maiden's gum	A very fast-growing, large tree, with bluish foliage in youth. Fairly drought and frost resistant. Will grow on poor soils if deep and well-drained. Produces a good, strong, useful timber.	A.	30s.	2s.
Eucalyptus melliodora	Yellow box	A medium-sized tree, useful for shelter belts. Produces a tough, durable timber. Very resistant to drought and frost. Valuable for honey production, having abundant sweet flowers.	A.	15s.	1s.
Eucalyptus paniculata	Grey ironbark	A very good timber tree, with heavy foliage. Suitable for the moister regions, with a deep, fertile soil. Withstands some drought, but is frost-tender. Yields an excellent, hard, durable wood.	A.	15s.	1s.
Eucalyptus punctata ...	Leather jacket	A tree of fair size, yielding a good, durable timber. Adaptable as regards soil and climate, but will not withstand a dry, cold climate.	A.	15s.	1s.
Eucalyptus robusta ...	Swamp mahogany ..	A quick-growing, shady tree, which requires a moist soil for best results, but will grow under fairly dry conditions, provided frost is not severe. Recommended rather for shelter belts than plantations.	A.	15s.	1s.
Eucalyptus rostrata ...	Red gum	Produces an excellent and durable hardwood. Withstands drought, heat, brak, flooding and a good deal of frost. One of the best species for planting in Southern Rhodesia, except in sour soil and wet mountain regions.	A.	15s.	1s.
Eucalyptus saligna ...	Sydney blue gum ...	A fast-growing, useful tree, producing a useful medium hardwood. Thrives on deep, fertile soils in the heavier rainfall areas. Tender to frost and drought.	A.	15s.	1s.
Eucalyptus sideroxylon	Red ironbark.	A fairly slow-growing species, suitable for dry, rocky soils in the moister regions. Produces a good, durable hardwood.	A.	15s.	1s.
Eucalyptus tereticornis	Forest red gum	Similar to Eucalyptus rostrata, and can be planted along with it, except in areas liable to flooding and great heat. Perhaps not quite as drought-resistant.	A.	15s.	1s.

Botanical Name.	Common Name.	Remarks.	Price of trans-plants.	Price of seed. Lb.	Price of seed. Oz.
Grevillea robusta	Silky oak	A handsome tree which thrives best in moist, warm localities. Useful for ornament, shade and timber. Frost-tender and not resistant to drought. If the locality is unsuitable, it may grow well for several years and then die out.	A. C.	...	pkt. 1s.
Jacaranda mimosaefolia	Jacaranda	An ornamental tree with feathery foliage and abundant blue flowers, which appear in spring. Best development is attained in the moister regions, but the tree withstands drought to a surprising extent, and may be planted in the drier regions if the soil is reasonably deep and fertile. It is tender to cold and frost, and may need protection in its earlier youth. Semi-deciduous.	A. C.	20s.	1s. 3d. pkt. 1s.
Pinus canariensis	Canary Island Pine ...	Hardy to drought, but not to severe frost. Best suited for planting on higher altitudes and in higher rainfall areas. Slow growth in early youth, then more rapid in later years. A handsome tree with inverted, umbrella-like branches, not spreading. Yields an excellent softwood timber.	A. C.	15s.	1s.
Pinus halepensis	Aleppo pine	A drought-resistant pine which will grow on limestone and shale soils. Not recommended for plantations, but can be used for shelter and ornamental purposes in the drier regions.	A. C.	15s.	1s.
Pinus radiata (insignis)	Remarkable pine ...	A large tree of very rapid growth, producing a useful softwood. Most at home in the heavier rainfall areas. Does not like sour or poorly-drained soils. Frost-hardy but not drought-resistant, usually failing at an early age in the drier regions.	A. C.	15s.	1s.
Pinus longifolia	Chir pine	A somewhat slow-growing pine, but useful to plant in localities where the climate and soil are doubtful at the higher elevations. For timber and ornamental purposes. Not frost-resistant or very drought-hardy.	A. C.	15s.	1s.

Pinus pinaster	Cluster pine	Yields a useful, strong softwood. Does well on sandy soils and soils without *much lime*, in the better rainfall areas. Not very drought-resistant.	A. C.	15s.	1s.
Populus alba	White poplar	A rapid-growing poplar, requiring a good, deep soil in close proximity to running water. Propagated by suckers. Deciduous.	Suckers at 9s. per 100		
Populus deltoidea, var. ***missouriensis***	Carolina poplar	A very fast-growing poplar, producing a very good timber for matches, etc. Requires a rich, moist, alluvial soil. Moderately frost-hardy. Does *not* like stagnant water.	C.		
Salix babylonica	Weeping willow	A useful timber and ornamental tree, *requiring* a moist, well-drained soil which is occasionally flooded. Not suited for ground in which water is stagnant.	C.		
		Ornamental Trees, Shrubs and Hedge Plants.			
Abelia floribunda	—	A shrub with myrtle-like leaves, evergreen if watered. Pink-white flowers in profusion. Is used for hedges in Natal.	E.		
Aberia caffra	Kei apple	A rough, thorny, impenetrable shrub, making a good hedge. Withstands frost and drought well. Suited for all but the driest areas of the Colony. More useful than ornamental. Slow growing.	B. E.		
Abutilon chinensis ...	Chinese lantern	An ornamental shrub, with orange-coloured flowers, requiring a heavy pruning about the fourth year.	E.		
Acacia Baileyana	Silver wattle	A small ornamental tree with blue foliage and yellow flowers.	E.		
Acalypha marginata ...	—	Margin of leaf crimson: a shrub: will grow *to 10 feet* in height, or clipped to shape. Very useful to give colour to *shrubbery*.	E.		
Agapanthus umbelatus	Cape Lily	Blue and white varieties.	E.		
Aleurites fordii	Tung oil	An important oil-bearing tree from China. 25 to 30 feet in height.	E.		

Botanical Name.	Common Name.	Remarks.	Price of trans-plants.	Price of seed. Lb.	Oz.
Aloysia citriodora	Lemon-scented verbena	A small shrub with a strongly lemon-scented foliage. Hardy, vigorous, quick-growing.	E.		
Alstonia scholaris		A white flowered shrub, 6 feet high, similar to Oleander.	E.		
Bauhinia galpini	Pride of de Kaap ...	A rambling shrub, bearing orange-red flowers. Hardy.	D. E.	...	pkt. 1s.
Bauhinia acuminata ...	Bauhinia	A large, indigenous shrub, flowering profusely in early spring. *White flowers. Hardy.*	D. E.	...	pkt. 1s.
Bauhinia purpurea ...	Bauhinia	Similar to the Bauhinia acuminata, but with mauve flowers. Hardy.	D. E.	...	pkt. 1s.
Bolusanthus speciosus	Rhodesian tree wistaria	An indigenous, deciduous tree with blue flowers at the end of long stalks. Ornamental.	E.		
Brugmansia Knightii ...	*Moonflower*	A flowering shrub with large, drooping, white flowers. Strong scent (cf lily). Fairly frost-hardy.	E.		
Buddleia sp.	Blue buddleia	A medium-sized shrub with sweet-scented blue flowers. *Useful as a hedge. Rapid-growing*, but frost-tender.	E.		
Buddleia sp.	Yellow buddleia	A rank-growing, yellow-flowering shrub. Useful as a *hedge. Rapid-growing. Frost-tender.*	E.		
Callistemon speciosus ...	Bottlebrush	A scarlet-flowering shrub of drooping habit. Makes an excellent hedge if trimmed along the top only.	A.C.E.	...	2s. pkt. 1s.
Carica papaya	Pawpaw	A small tree with a large, dark green foliage, bearing large edible fruits.	E.		
Casimiroa edulis	Mexican apple	A large, rapid-growing tree, 30-40 feet in height, ever-green, and bears a delicious fruit. A fine shade tree.	E.		
Cassia capensis	Cape laburnum	A rapid-growing shrub, bearing masses of bright yellow flowers.	E.		
Cestrum aurantiacum ...	Ink berry	A small shrub, bearing orange flowers in profusion.	E.		

Cinnamomum camphora	Camphor	A somewhat slow-growing, ornamental, evergreen tree, *with camphor-scented foliage. It requires a deep* soil in the higher rainfall zones.	D.		
Crataegus oxyacantha	Hawthorn	Fruits yellow. Deciduous shrub. The yellow berries *hang throughout the winter.*	E.		
Crataegus pyracantha ...	Hawthorn	Berries scarlet. Shrub evergreen if watered throughout the winter.	E.		
Croton sylvaticus	Mount Selinda linden	A large-leaved, deciduous tree from Melsetter.	E.		
Cyphomandra betacea ...	Tree tomato	The well-known tree tomato. Will grow anywhere where Paw Paws will thrive.	E.		
Dahlia imperialis	Tree dahlia	A medium-sized shrub, making a handsome show with *its single* white blooms.	E.	...	pkt. 1s.
Dalbergia sissoo	Sissoo	A large deciduous tree from India, producing an excellent timber. Desires a deep, porous, well-drained soil in close proximity to running water. *Will not* tolerate stiff clay. Frost-hardy, but not very drought-resistant. Rapid-growing.	D.		
Datura arborea	Tree tomato	A large shrubby tree, up to *30 feet in height, with* large purple flowers. Very quick grower.	E.		
Deutzia crenata	Bridal wreath	A small deciduous shrub with *double white* flowers, tinged slightly pink, on long, drooping stalks.	E.		
Duranta plumieri	Tree forget-*me-not* ...	A medium-sized, deciduous shrub with blue flowers. Useful as a hedge. Very hardy.	E.		
Eugenia braziliensis ...	Brazilian cherry	A small shrub, bearing orange-coloured, edible fruits. A useful hedge plant.	D.		
Euphorbia splendens ...	Christ thorn	A small thorny shrub with bright scarlet flowers. Suitable for low hedges and borders.	E.		
Freylinia tropica	Inyanga hedge plant	A useful hedge shrub. Indigenous.	B.		
Gardenia florida	Katjepeering	A compact, evergreen shrub with dark green, glossy leaves and pure white, sweetly-scented *double* flowers.	E.		

Botanical Name.	Common Name.	Remarks.	Price of transplants. 3s. 6d. per doz.	Price of seed. Lb.	Oz.
Gerbera Jamesonii ...	Barberton daisy	Hybrids.	E.		
Hamelia patens	...	A compact shrub 8 feet to 10 feet in height, flower orange-yellow tubes, a showy shrub.	E.		
Heliotropium peruvianum	Heliotrope	A small shrub with sweet-scented lilac or nearly white flowers. Suitable in flower border.	E.		
Hibiscus rosa-sinensis ...	Chinese rose	Evergreen shrub with numerous scarlet flowers. Double and single varieties.	E.		
Hibiscus syriacus	Christmas rose	A shrub of which there are single and double varieties with white flowers.	E.		
Holmskioldia sanguinea	Holmskioldia	A fairly hardy shrub, bearing a profusion of brick-red flowers in large bunches. Suitable for hedges.	E.		
Holmskioldia sp.	Holmskioldia	A yellow-flowering, handsome shrub similar to Holmskioldia sanguinea.	E.		
Hydrangea japonica ...	...	A well-known shrub. The flowers are naturally pink, and are changed to blue by feeding the plants with small quantities of Nitrate of Soda, as they grow.	E.		
Hypericum lanceolatum	St. John's wart ...	A small, yellow-flowering shrub. Multitudes of flowers.	E.		
Iboza riparia	Rhodesia spirea	A blue-flowered shrub, indigenous to the Colony. 6 feet to 8 feet in height.	E.		
Iochroma tubulosa ...	*Iochroma*	*A shrub with dark blue flowers.*	E.		
Iochroma sp.	Iochroma	A shrub with scarlet flowers.	E.		
Lagerstroemia indica ...	Pride of India	A large ornamental shrub, with mauve and pink flowering varieties. Handsome and hardy.	E.		
Ligustrum lucidum ...	Chinese privet	An excellent hedge plant or ornamental shrub. Can be clipped into shape. Liable to die off in patches or lose its lower leaves unless planted in moist soil of fair depth. Propagated from cuttings.	A.		

Melia azedarach	Syringa	A deciduous tree, producing a good light timber. Shallow rooting. Withstands drought well. Has fine lilac flowers and persistent yellow berries. Suitable for better rainfall areas and deep sandy soil, but will grow under severe conditions.	E.	
Morus sp.	Mulberry	A very large fruited variety.	E.	
Moschosma	Rhodesian spirea ...	A medium-sized, blue-flowering shrub.	E.	
Nerium oleander	*Ceylon rose*	The Oleander, Salmon-pink also a white variety.	E.	
Parkinsonia aculeata ...	Jerusalem thorn	A light foliaged tree, up to 20 feet high, with little yellow flowers, very beautiful as isolated specimen on a lawn.	E.	
Persea gratissima	Avocada pear	A shrub with an edible fruit.	2s. 6d. *each*	
Photinia japonica	Loquat	A *small evergreen* tree with large leaves, bearing yellow edible fruit.	D. E.	
Phytolacca dioica	Belbambra	A rapid-growing, deciduous tree. Useful for ornament. Timber of no value, but seeds valuable as a poultry or cattle food.	A. ...	pkt. 1s.
Pittosporum undulatum	Camphor laurel	An Australian evergreen shrub, making an excellent hedge, with shining, green, scented leaves and scented berries.	9s. per 100 Class A	
Plumeria rubra	Frangipani	A handsome shrub with pinkish red flowers. Rather delicate.	2s. 6d. each	
Poinciana regia	Flamboyant	A handsome red flowering, feathery foliaged tree.	D.	
Poinsettia pulcherrima	Poinsettia	A shrub with small yellow flowers surrounded by many large, scarlet, leaf-like bracts. Very showy. Double and single varieties.	E.	
Poinsettia alhida	Poinsettia	As above, but with yellowish white bracts. Double and *single varieties.*	E.	
Psidium pomiferum ...	Guava	A small, hardy, evergreen tree, bearing edible, yellow fruit.	D. E.	

Botanical Name.	Common Name.	Remarks.	Price of trans-plants.	Price of seed. Lb.	Oz.
Punica granatum	Pomegranate	A shrub or small tree, having shining leaves, large scarlet flowers and large red fruit. Makes a useful hedge when well cut regularly.	E.		
Rhus lancea	Karreeboom	A small indigenous tree of graceful appearance, yielding a very durable wood. Useful for ornamental purposes. Forms a fine hedge.	A.	10s.	9d.
Russelia juncea	Coral fuchsia	A pretty red-flowered shrubby plant about 6 feet high.	E.		
Salvia involucra	Salvia	A free-growing shrub with red flowers. Not frost-hardy.	E.		
Spathodea campanulata	African flame tree ...	A handsome, heavy-foliaged tree, bearing bright red flowers. Suited for the heavier rainfall areas on deep soils.	6d. each 18s. per 100		
Streptosolen Jamesonii	Streptosolon	A shrub with orange-coloured flowers in dense masses and pale green foliage. Very frost-tender and delicate.	E.		
Strobilanthes sp.	...	A shrubby herbaceous plant covered with intense blue flowers in the Autumn. 3 feet high.	E.		
Tecoma Smithii	Tecoma	An upright, medium-sized shrub with tubular, bright yellow flowers. Forms a useful hedge. Fairly drought-resistant.	A. E.	...	pkt. 1s.
Thevetia neriifolia	Thevetia	An evergreen shrub, bearing bell-shaped, yellow flowers. Hardy.	E.		
Thuya orientalis	Thuya	A very hardy conifer that withstands heat, cold and drought, and does not mind heavy soils. Slow-growing. Of small size. Very good for hedges.	A. C.	...	pkt. 1s.

Roses from 1s. to 3s. 6d. each.

Climbers and Creepers.

Botanical Name.	Common Name.	*Remarks.*	Plants each.
Ampelopsis veitchii ...	Virginia creeper	Too well known to need description.	E.
Antigonon leptopus ...	Coral creeper	A showy climber, bright pink flowers, forms large bulbs underground. Takes two or three years to reach flowering size, after this it makes a wonderful display yearly.	E.
Aristolochia elegans ...	Dutchman's pipe ...	A rank-growing creeper. Heart-shaped leaves. Purplish crimson flowers, spotted yellow.	E.
Aristolochia tomentosa	Dutchman's pipe ...	A rapid-growing climber, with crimson purple flowers.	E.
Beaumontia grandiflora	Beaumontia	A large climber with heavy, glossy foliage. Large white, bell-shaped flowers. Blooms profusely. Fairly frost-tender.	1s. 3d.
Bignonia venusta	Golden shower	Vigorous creeper. Rapid-growing. Bears masses of orange flowers all the year round. Very useful and hardy.	1s. 3d.
Bignonia speciosa	Bignonia	A rapid-growing, showy creeper, bearing large mauve flowers. Decumbent.	E.
Bougainvillaea splendens	Bougainvillaea	Vigorous climber. May be also used as a hedge. Bracts magenta. Fairly frost-hardy.	1s. 3d.
Ficus repens	...	A valuable climber for walls, etc., used in places where the Virginia creeper is grown, but clings to the surface much better than the latter, rather slow at first.	E.
Hedera helix	Ivy	A dark evergreen climber. Best in shady, cool climates.	9d.
Jasminum sambac	Jasmine	A vigorous, evergreen shrub climber with large trusses of fragrant, white flowers.	1s. 3d.

Botanical Name.	Common Name.	Remarks.	Plants each.
Jasminum primulinum	Climbing jasmine ...	A yellow-flowering species similar to Jasminum grandiflorum.	9d.
Lantana salviaefolia ...	...	A fine little creeping shrub with pink flowers, very suitable for rockwork, or edging borders, etc.	E.
Lonicera periclymenum	Honeysuckle (Woodbine)	Hardy climber with sweet-scented flowers, yellow inside, reddish purple outside.	9d.
Lonicera sempervirens	Red honeysuckle ...	Climber with red flowers. Best kept well pruned or base becomes ugly.	9d.
Mandevilla suaveolens	Mandevilla	Deciduous climber, bearing trumpet-shaped, white, fragrant flowers. Very slender.	9d.
Passiflora edulis	Granadilla	A quick-growing climber, bearing edible fruits. Subject to woolly aphis if overshaded. A good trellis plant.	E.
Passiflora sp.	Fiji granadilla	A large-leaved climber, bearing yellow fruits. Flowering well. A good trellis plant.	E.
Podranea Brycei	Zimbabwe creeper ...	A rank-growing indigenous creeper with large, pink flowers.	E.
Rosa bracteata	Macartney rose	Plant with large green foliage and numerous white single flowers. Useful as a hedge plant.	1s.
Solanum Wenlandii ...	Blue potato creeper ...	A rapid-growing creeper with tubular, blue flowers. Not frost-hardy.	E.
Wistaria chinensis	...	The well-known climber with lavender coloured panicles of flowers. Purple, and blue kinds also in stock.	E.

Palms, Bamboos, etc.

Arundo donax	*Spanish reed*	A reed growing 20 feet to 25 feet in height and 1 inch thick, and very superior to the indigenous variety.	Offsets 1s. 6d. each
Bambusa fortunei	Fortune's bamboo ...	A small variety, 6 feet high, with canes about the thickness of a lead pencil, extremely useful for stakes in the garden.	Offsets 2s. 6d. each
Bambusa arundinacea ...	Whipstick bamboo ...	About 30 feet.	Offsets 2s. 6d. each
Bambusa sp.	Japanese striped bamboo	A very ornamental variety with golden rods marked and striped with green lines, about 20 feet.	Offsets 2s. 6d. each
Bambusa sp.	Indian variety	Similar in growth to the Bindura, with very useful rods.	Seedlings 9d. each
Chamaerops excelsa ...	Fan palm	Suitable for shrubberies, etc.	...
Cortaderia argentea ...	Pampas grass	With long white plumes about 6 feet in height, must be grown near water or close to a tap.	Seedlings 9d. each Offsets 2s. 6d. each
Cyperus papyrus	Papyrus grass	A very handsome subject for the water garden, or planted near the drip of a tap, it does best when growing in the water.	3s. 6d. each
Oxytenanthera abyssinica	The Bindura bamboo	The only variety indigenous to Rhodesia, giving very useful solid rods, very tough.	Seedlings 9d. each
Phoenix reclinata	Date palm	A very hardy palm, indigenous to the Colony.	...
Phormium tenax	New Zealand flax ...	A useful green foliaged plant, about 4 feet high with sword-like leaves.	E.
Washingtonia robusta ...	Fan palm	A strong-growing fan palm.	...

Palms 2s. 6d. to 5s. each.

Offsets of Bamboos supplied during January only.

DEPARTMENTAL BULLETINS.

The following Bulletins, consisting of reprints of articles which have appeared in this Journal, are available for distribution at 3d. per copy. *Application should be made to the Editor, Department of Agriculture,* Salisbury, and remittances must accompany orders.

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No. 657. Hay-making in Southern Rhodesia, by C. Mainwaring, Agriculturist.

No. 663. The Use of Fertilisers and Manures in Southern Rhodesia, by A. D. Husband, A.I.C., Chief Chemist.

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No. 681. *The Sunflower (Helianthus Annuus) (Revised)*, by S. D. Timson, M.C., Dip.Agric.

No. 694. The Edible Canna (Canna Edulis), by D. E. McLoughlin.

No. 695. The Castor Oil Plant (Ricinus spp.), by S. D. Timson, M.C., Dip.Agric.

No. 697. Results of Analysis of Samples taken under the "Fertilisers, Farm Foods, Seeds and Pest Remedies Ordinance" during the year 1927-28.

No. 704. The Importance of Research on Pasture Improvement in Southern Rhodesia, by A. D. Husband, A.I.C., Chief Chemist.

No. 705. Suggested Cropping Programmes for Farms on the Sand Veld, by D. E. McLoughlin, Assistant Agriculturist.

No. 706. A Farmers' Calendar of Crop Sowings, by C. Mainwaring, Agriculturist.

No. 709. Sand Veld Farming and its Possibilities, by E. D. Alvord, M.Sc. (Agr.).

No. 710. Monthly Reminders for the Farming Year, by the Division of the Chief Agriculturist.

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