

OBSERVATIONS ON EYE WORMS OF BIRDS.

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THE presence of worms in the eyes of birds was apparently first noted about 1819, when Rudolphi described a number of species. From 1825 onwards a noted collector named Natterer appears to have concentrated his attention on the parasites of birds, paying special attention to the parasites of the eyes. He appears to be responsible for quite half the species recorded to date, which were collected principally in Brazil. They were described by Molin (1860), since when various authors have found and described new species from other parts of the world.

Kreffit (1871) first recorded the presence of worms from the eyes of wild birds from the Australian region. These worms were placed in the genus *Ascaris* (*Ascaris* sp.), and were recovered from the Red-wattle bird or Gill bird, *Acanthochæra carunculata* Lath. Johnston (1912) redescribed it as *Ceratospira acanthochæra*, later placing it in the genus *Oxyspirura*; Railliet, Stiles, and Hassall give the specific name as *Anthochæra*. Von Linstow (1897) found worms in the eyes of Brenchley's Fruit Pigeon, *Zonocnas brenchleyi*, from Bismarck Archipelago, describing it as *Ancyracanthus opithamica*; Ransom (1904) brought it into the genus *Ceratospira*.

From 1913 onward special attention has been paid to the presence of worm parasites in the eyes of wild birds in North Queensland. Nicoll (1914) recorded parasites from the eyes of the Wedge-tail eagle, *Uroæetus (Aquila) audax*, and the Brown hawk, *Hieracidea verigora*, which were placed provisionally in the genus *Oxyspirura*. Breinl (1913) recorded *Filaria dactylonis* from the Laughing Jackass; *Dacelo leachi*, which was placed by Johnston (1916) in *Ceratospira*; and latterly this species has been placed in the genus *Thelazia* by York and Maplestone (1926). The presence of an *Oxyspirura* sp. from the Sea Eagle, *Haliæetus leucogaster* is here recorded. These records form the positive findings of a systematic examination of 250 wild birds for ecto and endo parasites, special attention being paid to the eyes. The list of birds examined includes 109 domestic birds; of the wild birds examined 5 were found to be infected, or 2 per cent. of the total; of the 109 domestic birds 51 were positive, or 46.88 per cent. In the following list of birds examined, the common and ornithological names are given to avoid confusion:—

		Number Exmd.	Nega- tive.	In- fected.
Bee eater (sacred king- fisher)	<i>Halcyon sanctus</i>	1	1	..
Bower bird	<i>Chlamydochroa orientalis</i>	2	2	..
Butcher bird	<i>Cracticus destructor</i>	3	3	..
Canary, native	<i>Ptilotis fusca</i>	4	4	..
Cockatoo, black	<i>Calyptorhynchus funereus</i>	1	1	..
Cockatoo, white	<i>Cacatua galerita</i>	6	6	..
Cormorant	<i>Plotus (Anhinga) novæ hollandiæ</i>	2	2	..
Coot, bald	<i>Porphyrio melanonotus</i>	19	19	..
Crane, white	<i>Herodias timoriensis</i>	2	2	..
Crane, blue-grey	<i>Notaphox novæ hollandiæ</i>	2	2	..
Cuckoo	<i>Eudynamis cyanocephala</i>	4	4	..
Cuckoo, chestnut breasted	<i>Cacomantis castaneiventris</i>	1	1	..
Cuckoo, shrike, black- faced	<i>Graucalus melanops</i>	2	2	..
Curllew	<i>Numenius cyanopus</i>	1	1	..
Dove, large (wood-pigeon)	<i>Geopelia humeralis</i>	1	1	..
Drongo, fish tail	<i>Chibia bracteata</i>	6	6	..
Duck, black	<i>Anas superciliosa</i>	12	12	..
Duck, Indian Runner (penguin duck)	?	13	13	..
Duck, muscovy	<i>Cairina moschata</i>	3	..	3
Duck, whistling	<i>Dendrocygna arcuata</i>	12	12	..
Eagle, sea	<i>Haliæetus leucogaster</i>	1	..	1
Eagle, wedge tailed	<i>Uroæetus (Aquila) audax</i>	2	1	1
Fig bird	<i>Sphecotheres maxillaris</i>	11	11	..
Fowl, domestic	<i>Gallus domesticus</i>	82	34	48
Friar bird (leather head)	<i>Tropidorhynchus corniculatus</i>	10	10	..
Frog mouth	<i>Podargus phalaenoides</i>	4	4	..

		Number Exmd.	Negative.	Infected.
Goose, domestic	<i>Anser cinereus</i>	2	2	..
Goose, pied	<i>Anseranas semipalmata</i>	1	1	..
Grebe, hoary headed	<i>Podiceps poliocephalus</i>	1	1	..
Hawk, brown	<i>Hieracidea berigora</i>	10	9	1
Hawk, sparrow	<i>Accipiter cirrhocephalus</i>	1	1	..
Hen, water	<i>Gallinula tenebrosa</i>	1	1	..
Heron, Nankeen	<i>Nycticorax caledonicus</i>	2	2	..
Honeyeater, blue faced	<i>Entomyza cyanotus</i>	1	1	..
Ibis, glossy	<i>Plegadis falcinellus</i>	3	3	..
Ibis, straw necked	<i>Carphibis spinicollis</i>	2	2	..
Jay, blue	<i>Coracina robusta</i>	4	4	..
Kingfisher, Leach's	<i>Dacelo leachi</i>	10	8	2
Lark, magpie	<i>Grallina picata</i>	7	7	..
Lorikeet, blue-bellied	<i>Trichoglossus novæ hollandiæ</i>	10	10	..
Magpie	<i>Gymnorhina tibicens</i>	2	2	..
Mocking bird	<i>Anellobia chrysoptera</i>	3	3	..
Mynah bird	<i>Acridotheres tristis</i>	11	11	..
Native companion	<i>Antigone austaliana</i>	11	11	..
Oriole, northern	<i>Oriolus affinis</i>	2	2	..
Owl, brown	<i>Ninox boobook</i>	1	1	..
Owl, masked	<i>Strix novæ hollandiæ</i>	1	1	..
Parakeet, red shouldered	<i>Neophema pulchella</i>	2	2	..
Pelican	<i>Pelicanus conspicillatus</i>	1	1	..
Pigeon, barred wing	<i>Phaps chalcoptera</i>	2	2	..
Pigeon, domestic	<i>Columbia livia domestica</i>	9	7	2
Pigeon, pheasant	<i>Macropygia phasianella</i>	4	4	..
Pigeon, purple-crowned fruit	<i>Ptilopus superbus</i>	1	1	..
Plover, spur wing	<i>Lobivanellus lobatus</i>	11	11	..
Rail, land	<i>Eulabeornis philippinensis</i>	2	2	..
Sandpiper	<i>Tringoides hypoleucus</i>	18	18	..
Shag	<i>Phalacrocorax carbo</i>	3	3	..
Sheldrake, white headed	<i>Tadorna radjah</i>	2	2	..
Snipe	<i>Rostratula australis</i>	1	1	..
Spoonbill	<i>Platalea regia</i>	2	2	..
Sun bird	<i>Cinnyris frenata</i>	1	1	..
Swan, black	<i>Cheonopsis atrata</i>	4	4	..
Thrush (babbler)	<i>Pomaterhinus rubeculus</i>	1	1	..
Turkey, scrub	<i>Cathartus lathamii</i>	2	2	..
		359	303	56

Examination of Young Chickens.

Attention is drawn to an examination of one poultry yard, taking only young chickens into consideration. The results are not included in the general list of birds examined. The total number examined was forty-five chicks, ranging from three days to twenty-four days old. The table shows the age and the results obtained, giving positive findings in 32 per cent.

	Number Examined.	Negative.	Infected.
3-day old chicks	8	8	0
7-day old chicks	12	12	0
10-day old chicks	14	12	2
14-day old chicks	3	0	3
18-day old chicks	2	0	2
24-day old chicks	8	1	7
10-21-day old muscovy ducks	3	1	2
Total	50	34	16

Worm parasites from the eyes of domestic birds were first found by Dr. Manson at Amoy, China; these were described by Cobbold (1879) as *Fiaria mansoni*. Since that time this parasite has been recorded in other parts of the world, and appear to be closely associated with the two tropical lines of Cancer and Capricorn. The following are the places from which the parasite has been recorded:—Florida (Niles 1904), Ransom; Jamaica (Clark 1904), Ransom; Mauritius (Emmerez 1901); Isle of Reunion (Ozoux 1910); Brazil (Megallias 1888); Guam Ladrome Islands (Barber 1916); Hawaii (Norgaard 1918); Java (Penning 1894) (Smit 1918); Annam Indo-China (Carougeau 1902); Rabaul Mandated Territory of New Guinea (Heydon 1926), Fielding; New South Wales (Johnston 1909-10); North and Central Queensland (Tryon 1907-8), (Dodd 1909), (Sweet 1910), (Breinl 1913), (Nicoll 1914), and (Fielding 1926); the latter author records finding it in the muscovy duck, *Cairina moschata*.

In a recent paper on the subject, the present writer draws attention to having obtained specimens from inland centres, thereby dispelling the idea that it only occurs on the sea-coast. Ozoux (1910) drew attention to its occurrence in mountainous districts on Reunion. Smit (1918) states that Neveu-Lemaire says that the parasite does not occur on the sea-coast.

As pointed out by Fielding (1926), various experiments have been carried out on the question of the elucidation of the life history, and has himself been working on the question for the past twelve to thirteen years, during which time some thousand or so experiments and dissections, which were the fore-runners of the findings tabulated by him, were carried out. He shows that the cockroach *Pycnoceclus* (*Leucophaea*) *surinamensis* L. is responsible for the transmission of the parasite, and succeeded in infecting young and old ducks and young chicks experimentally by feeding the cockroach to the birds, and that the time taken for worms to appear in the eyes of birds, after having swallowed the roaches, is very short.

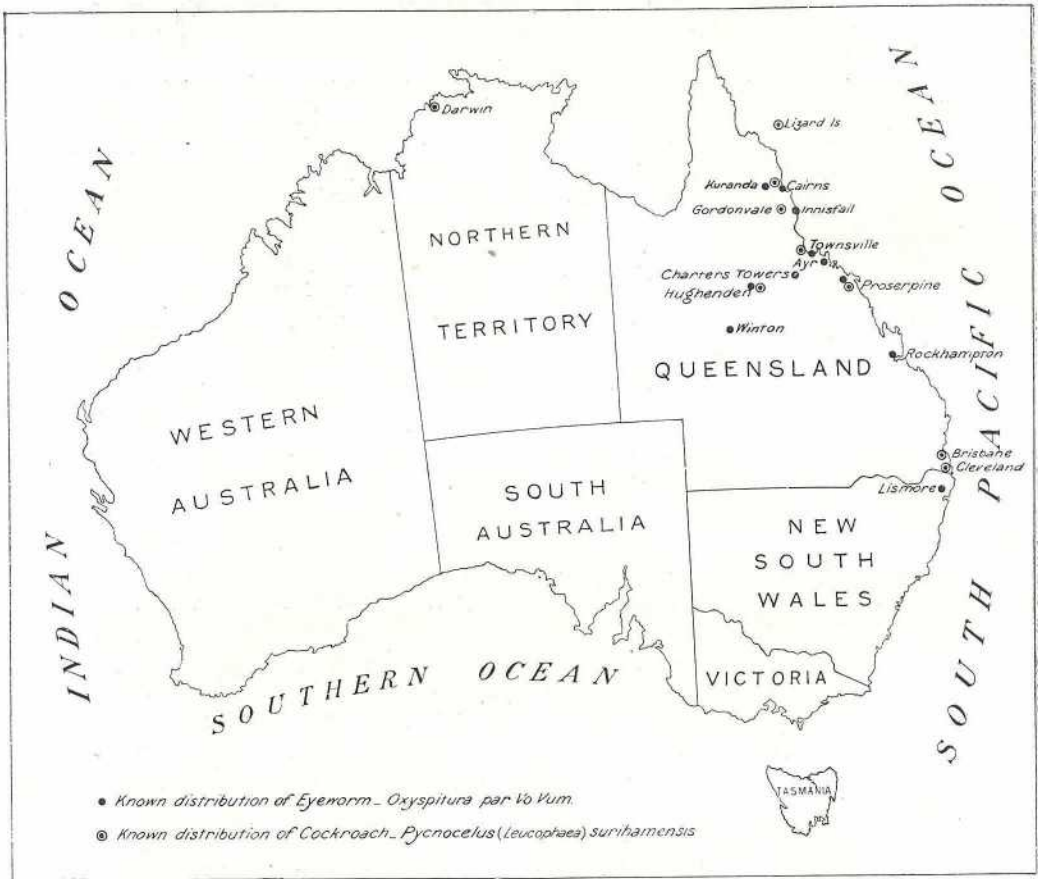
That there is an association between the eye-worm of poultry *Oxyspirura parvovum* and the cockroach *Pycnoceclus* (*Leucophaea*) *surinamensis* in Australia is indicated on consulting the map showing the distribution so far as is known at present. This is further accentuated on taking the known distribution of *O. mansoni* and the cockroach into consideration throughout the world, which shows that of the places where the worm parasite is known six have also the cockroach. So far we have no records of the occurrence of the roach in Indo-China, Guam, or Rabaul, Mauritius, Reunion, New South Wales, Florida, Jamaica, but owing to the fact that it has been recorded from adjacent places, it is hardly conceivable that it does not occur in the places mentioned. As regards Florida and Jamaica we would draw attention to Doucette and Smith's statement that it occurs on the eastern portion of the United States, and has also been recorded from Mexico.

General Sanitary and Hygienic Considerations.

It is undoubtedly of first importance that the general sanitary and hygienic condition of the poultry yard should be attended to. Even under the ordinary rules of poultry keeping the first essentials are—open air, light, cleanliness, and careful feeding. Infinitely more necessary is it that these conditions should be given with a disease of such importance as the one under review. It is considered that in an endemic area the poultry yard should have a minimum of shade so that the penetrating and sterilising effect of nature's own disinfectant can be made of more use—viz., the sun. This minimum of shade is not only meant in the ordinary sense but also as regards shade for insect pests in the fowl-house and yard generally. The yard should be thoroughly cleaned, and the droppings cleaned up at regular intervals and spread out in the sun to dry and eventually burned. All bags, boxes, boards, and other material which might serve as hiding-places for cockroaches, crickets, and other insect pests should be burned. Disinfectants should be sprayed at frequent intervals around the fowl-house and shady spots, or powdered lime, borax, or sodium fluoride mixed with flour should be sprinkled wherever cockroaches are prevalent. Recently in the United States, Doucette and Smith (1926) have recommended the use of a solution of sodium cyanide sprayed on the soil for the destruction of the cockroach which is now known to be responsible for the transmission of eye-worms of poultry. As they were working under conditions totally different from those obtainable in a poultry yard, and as this solution is a deadly poison, it should be clearly understood that the birds would have to be segregated during operations, and all refuse and detritus cleaned up afterwards. Even then there would appear to be a certain amount of risk attached to its use, owing to the fact that the fowls scratching around in the soil for tit-bits may pick up some particles impregnated with the compound. On general grounds the feeding should be carried out on the hopper principle, and the drinking water supplied on the fountain system.

Treatment.

Various methods of treatment, aiming at the destruction of the worm parasites of the eyes have been put forward, but to appreciate fully the effects of any treatment, it would appear necessary to point out that there is a wide space all around the eyes communicating with the beak and mouth called the infraocular sinus, through which the tears drop into the buccal cavity, and that the worm can and does pass out from the eyes through this sinus into the mouth, or from one eye to the other, thereby evading for a time the effects of the treatment of the eyes. Obviously, whatever method of treatment is given, it is necessary, to get the best results to carry the treatment to the only means of escape for the worms from the eyes, viz., the opening into the mouth of the sinus. This end is accomplished by painting the opening with the solution by means of a camel-hair brush.



The following solutions have been suggested:—(a) Dropping a solution of sodium bicarbonate into the eyes. (b) A similar proceeding with chloroform. (c) First anaesthetise the eyes with a 5 per cent. solution of cocaine, by drawing apart the eyelids and pouring a few drops of the cocaine into the eyes, allowing this to act for some time, and afterwards drawing up the nictitating membrane and placing a few drops of 5 per cent. creolene underneath. (d) By forcibly extracting the worms by means of a small pair of forceps (this is a dangerous practice and is better left alone). An improvement is here suggested, viz.—a small camel-hair brush. This method has been used for some years and has been found to answer quite well, but requires plenty of time and patience; even this is objectionable

owing to the creation of inflammation of the eyes. (e) Placing a small quantity of turpentine and allowing it to act for half an hour, followed by irrigation of the eyes with lukewarm water. (f) A weak solution of potassium permanganate (Condy's crystals); this is somewhat slow in action, and should be continued daily for a week or so. Further treatment directed at the alleviation and cure of the inflammatory and catarrhal conditions by irrigation of the eyes with a mild antiseptic as 4 per cent. boric acid. Ransom suggests the use of a mixture of nine parts of lard and one part of iodoform or carbolised vaseline.

TURKEY REARING.

P. RUMBALL, Poultry Expert.

There has been a serious falling off in the number of turkeys kept in Queensland during recent years, of which ample evidence is supplied by the Registrar-General in his annual reports.

This decline in numbers cannot be attributed to the lowered value of turkey flesh, as excellent prices are generally realised for good birds in the local markets, and in seeking the cause, one is forced to the conclusion that faulty methods of breeding and disease are the principal factors, although seasons and the ravages of foxes have probably played their part.

Suitable Localities.

The farm, by reason of offering turkeys ample range, thereby enabling them to indulge in some of their wild traits, is its natural home. Free range also enables turkeys to gather considerable quantities of their own food in the form of grass, insect life, and when stubbles are available, grains. Districts in which the soil is of a light nature and undulating is more suited to turkey raising than low-lying wet country. Scrub country offers ideal conditions, especially where there is a good supply of green feed and water.

Housing.

It is natural for turkeys to roost in the open, but, when there is no suitable belt of timber to afford protection, certain housing methods should be adopted to obtain the best results. These houses need not be very elaborate, but should be so constructed as to permit of a free circulation of air. Old open-fronted lofty barns are well suited for this purpose, but in districts in which turkeys have to be protected from the fox it may be advisable to adopt the following system:—Enclose an area of land, about $\frac{1}{2}$ an acre, with a 6-foot netting fence, and build a shed in the middle. This shed should face north, and be open in front with a 6-inch space between the back of the top wall and roof. The dimensions would vary according to the number of birds to be housed, but each bird should have a floor space of 15 square feet. The house should be 9 feet high in front and 7 feet at back. Perches should be about 3 feet high, all on the same level and 3 inches wide. Suitable nests could be placed around the enclosure and made to look as natural as possible with the help of bushes. The turkeys could be confined to these quarters at night, and allowed range during the day.

Breeding Stock.

There are several varieties of turkeys, but the American Bronze holds pride of place. This is a large and hardy breed, which has supplanted most other breeds, and appears to be well suited to our climate as well as our markets. Mature stock should only be used for breeders, two years and over being more suited than stock only a year old. One vigorous Tom can be mated with as many as ten hens, but probably six to eight females on the average would give better results.

In selecting, strength and vigour, coupled with the knowledge that your stock are from healthy parents, is of primary importance. The head should have a clean and healthy appearance, body compact and long. Sturdy shanks and strong toes with fair-sized bone indicating stamina.

Extra heavy show specimens do not make the best breeders. What is required, is stock in good hard condition and not fat; on the other hand, stock that are thin should never be used, as the lack of condition may be due to some inherited weakness. Hens weighing 16 to 18 lb. and Toms 25 to 30 lb. in fair condition will be found to give satisfactory results.

Avoid in-breeding and endeavour to obtain occasionally new Toms from reliable stock, but before buying make sure that he comes from healthy parents, and take further precautions by isolating him for some two or three weeks. The best hens raised on the farm should be reserved for breeding purposes, and not sold because there is a good market.

Hatching by Natural Methods.

Vermin must be carefully guarded against and when nesting in enclosed quarters, both the hen and the nest should have a good dusting with insect powder for a start, and again a few days previous to hatching. By taking these precautions you assure the young poults of a start in life free from vermin, which is a great aid to successful rearing. A turkey will only cover properly fifteen to eighteen eggs, and it is a good plan to set a few eggs under broody hens at the same time as the turkey is set, and when hatched to give all the chicks to the turkey, as she can comfortably mother about twenty-five. Food, water, and grit should always be handy to the sitting hen, and if the Tom is at all savage it is advisable to protect the nest and young.

Rearing.

It is found best to let turkey hens mother the chicks. When hatched, the young poults should be left undisturbed until thoroughly dry, they then may be temporarily removed to induce the turkey to remain on the nest, if it is found that the eggs are hatching irregularly. After the hatch is complete a coop which affords protection from wind, rain, and dampness should be provided. This coop should permit of a free supply of air and be moved on to new ground daily. The hen and poults should be confined to the coop for ten days to a fortnight, but if the weather is fine the poults may be allowed a little liberty when the dew is off the grass; after this period it is generally safe to allow range, providing the grass is not too long and wet. When they have reached the age of five weeks, entire liberty can be given, allowing them to roost in barns, houses, or trees, according to the policy adopted.

Feeding.

No food should be given for at least forty-eight hours after hatching. Hard grit, charcoal, and water should be the first food provided. The hard grit assists in mastication and charcoal has no equal as a bowel corrector. Turkey chickens will gorge themselves if allowed, and this gorging is responsible for a considerable amount of trouble. Turkeys in their wild state would gather their food very slowly, and it is found best to imitate them as far as possible by only feeding the young chicks a little at a time and fairly frequently. This prevents them from over-loading their digestive organs and helps to retain that keenness of appetite which is essential to successful raising of poultry of all kinds.

Stale bread soaked in milk and then squeezed fairly dry is the most handy food on the farm and also gives excellent results. This can be fed five times a day for a few days, and variety can be made by the replacement of some of the meals with chick grains, mashes of brand and pollard mixed with milk, to which can be added a small amount of minced meat and tender green feed. This mash should be made crumbly and not sticky. When on range the quantities of food will vary according to what they can gather for themselves, but surplus milk can be fed at all times either thick or fresh, but it is as well to always feed it in the same condition. Green feed should be fed in abundance to both growing and adult stock, but where range is allowed on good green pasture it is not so important.

Grains should always be fed at night and so induce the flocks to return to their camps. Oats, maize, and wheat are suitable for this purpose.

In the management of turkeys, especially in the rearing of young stock, cleanliness is essential. Food should not be allowed to lie about or become decomposed, and a strict outlook must be kept for vermin of all sorts.

Diseases in Turkeys.

Turkeys are subject to practically the same diseases as other classes of poultry, but mention is made here of the most common and devastating diseases affecting the problem of turkey raising.

Black-head, Hepatitis, White Diarrhoea, &c.

This disease was given the popular name of black-head owing to the darkened appearance of the head of affected birds. The general adoption of the name is unfortunately misleading, as the darkening of the head is not noticed in all cases.

Old and young stock are affected, but heavy mortality is principally met with in young stock a few weeks old. The external symptoms are drowsiness, lack of vigour, and loss of appetite. Diarrhœa is nearly always present and of a yellowish colour, though sometimes white, due to the abnormal percentage of urates. The disease usually appears in the intestinal tract, the ceeca being the most seriously affected. The liver quickly becomes affected.

Cause.—Bacteriologists do not agree as to the particular organism which causes this disease, but they do, however, assert that it can be transmitted from mother to progeny by means of the infection of the egg, hence the necessity of obtaining stock free from the trouble. It is also readily transmitted from one bird to another through food coming in contact with the droppings from diseased stock.

Medicinal treatment has not proved successful, but where stock has been recently infected the following remedies may be adopted as a means of arresting the disease:—Thorough cleanliness of quarters and disinfection with a 5 per cent. carbolic acid solution. A teaspoonful of hydrochloric acid to a quart of drinking water often gives good results. Sour milk, by its action in keeping the intestinal tract in an acid condition, is also of value.

MAIZE AND LUCERNE.

Maize is one of the most valuable cereals grown in the State, and is used extensively as a fodder in the drought periods, saving thousands of merino sheep that are now grazing on the Western downs.

It is difficult to over-estimate the value of such fodder crops as maize and lucerne and the service they render to the live stock industry in the trying periods of drought. The value of the activities of our agriculturists throughout the State cannot be solely estimated on the basis of the market value of the maize and lucerne produced. To such values must be added that of live stock saved by feeding drought rations of maize and lucerne and so preserving an industry that contributes largely to our national wealth.

Favourable seasonal conditions have yielded heavy crops of these fodders, but market values have fallen below the cost of production. A surplus over the immediate market requirements depresses values, and the producer suffers in consequence. With our varying climatic conditions surpluses and scarcity of fodder often follow at intervals that are altogether too brief.

Conservation of fodder is of really vital importance to us all. Lucerne and maize are especially suitable for conservation purposes. Our pastoralists where practicable might insure the lives of their stock by purchasing and storing maize and lucerne hay in silos or lofts. At the market prices ruling in times of plenty for such products the premium is most reasonable. By taking steps in time to make their position more secure, they will also render a great service to primary producers engaged in the production of fodder crops by stabilising the market for them.

The menace of a prolonged dry spell has been lifted from most of the pastoral and agricultural areas of the State, and the future of both will be brighter and more secure if those controlling the pastoral industry will, where possible, make a special effort to purchase maize and lucerne for the purpose of storing for a lean period. Seasonal conditions will repeat themselves, and a period of high production is frequently followed by a subnormal season.—From Field Notes—by C. McGrath, Supervisor of Dairying.

A FARMER'S APPRECIATION.

Renewing his subscription, a Nambour farmer writes—

“I would like to add my congratulations to the Department for making available, at a small cost, such valuable information to the man on the land.”