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Camballin irrigation area : a summary of cropping and pasture studies 1958-1970

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Camballin Irrigation Area - A summary of Cropping and Pasture Studies 1958-1970

Compiled by Phongsak Yuhun

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Table of Contents

1. Introduction

This report summarizes the Department of Agriculture's involvement in the Camballin irrigation project located on the Fitzroy River in the West Kimberley area of Western Australia. The Camballin Irrigation area did not receive wide publicity like the Ord River Irrigation Scheme although it was the first large scale rice growing area in Western Australia and second only in size to the Murrumbidgee Irrigation Area in New South Wales. Initiated in the early 1950's and run by private enterprise, companies had large investments in the project. An example of the scale of investment can be seen from the last operation that ceased, due to flooding, in 1983 when 23,000 hectares of cropping was planned. Investment by the West Australian Government was considerable in construction of water control structures and crop and fodder research by the Department of Agriculture. It was hoped Camballin would develop into a highly productive irrigation area.

In spite of the high production potential of the area, and heavy investment by the Government and private companies, the cropping venture has never been successful since its inception. The major problem has been the inability to maintain constant water supply from the Fitzroy River which floods often. The last flood controlling structure built was a 17-kilometre levee. It did not withstand the floods of 1983 which effectively stopped the $20 million grain sorghum operation, the biggest ever planned for the area. Cropping has been plagued by birds, insects and heavy weed infestation. Other problems have included the remoteness of the area, lack of experience and poor planning.

The Department of Agriculture was directly involved in the area between 1958 and 1970, setting up a small experimental area at Camballin by invitation of NORTHERN DEVELOPMBNT PTY. LTD. The research activities were plagued with problems. Scientifically controlled experiments were rarely possible and a large number of trials had to be abandoned during their course. The major problems were a dependency of cropping operations on the Company's equipment, unreliable water supply, flood damage, lack of supervisory staff, remoteness of the area and lack of effective pest control.

This report summarizes the research carried out during the period which paralleled the commercial operation. The trials were designed to solve the specific cropping problems encountered over the period. Abandoned trials are listed in this report to illustrate the problems they were designed to elucidate and the unexpected problems encountered.

2. Canballin Irrigation Area

2.1 General Description

The Camballin irrigation area is situated on the flood plain of the Fitzroy River (l7°59'S, 124°ll'E, 45 metres above sea level) in the West Kimberley region of Western Australia (Figure 1). The area lies about 96 kilometres south-east of Derby on Liveringa station within the Djada Land System (Speck et al., 1964) which is described as active flood plains with extensive back-plains of juvenile cracking clays and dark cracking clays.

2.2 Climate

The West Kimberley is a region described as having semi-arid to arid monsoonal climate (Fitzpatrick and Arnold, 1964). About 92 per cent of Camballin's annual rainfall of 515 mm occurs between November and April (Figure 2). Temperatures during the day are high throughout the year, particularly during November and December, the start of the "wet" season, when maxima over 40°C are frequent. Temperatures at night are also high except for the winter months of June and July when the average minimum is about 13°C (Figure 3). Marked seasonal contrasts in humidity, cloud cover and radiation are also characteristic.

Rainfall is the major climatic factor that limits plant growth in the region. Rainfall figures over an 18 year period (1958 - 1970) indicate very little rain falls between June and October (Appendix Tables 1 & 2). Fifty seven per cent of Camballin's annual rainfall is recorded in January and February. Rainfall for these two months may reach over 300 mm.

Evaporation in the area is relatively high. Pan evaporation varies from about 5.5 mm per day in June of the dry winter period to over 11 mm per day in December (Figure 2).

FIGURE 1: Location map of Cambatlin Irrigation Area

FIGURE 2: Mean monthly rainfall and daily pan evaporation at Camballin

FIGURE 3: Mean monthly maximum and minimum temperatures at Camballin

2.3 Soil

The major soil of the irrigation area is of the Camballin series, described as deep, strongly cracking greyish-brown to brown clay with variable small occurrences of lime and gypsum (Churchward and Bettenay, 1962). The Camballin clay shows a marked similarity to the Cununurra clay of the Kimberley Research Station near Kununurra in the East Kimberley region. The intensive pattern of deep cracking makes this soil highly permeable when dry, but very slowly permeable when wet. This may lead to waterlogging that may affect susceptible crops. The soils are plastic and sticky when wet making cultivation difficult. Experience with rice growing showed that it could be cultivated to prepare a satisfactory seed bed. The soil is quickly dispersed in water and is not suited to earthworks for anti-erosion purposes. Soil erosion even on very gently sloping ground could be a major problem when the soil is ploughed.

Churchward and Bettenay (1962) found that the nitrogen content of the soil was relatively low, ranging from 0.03 to 0.07 per cent. The potassium level was 0.3 - 0.6 per cent in the acid-soluble form and the range of acid-soluble phosphorus was from 0.009 to 0.22 per cent. Experimental trials conducted by the Department of Agriculture in the early 1960's showed no marked positive response to phosphorus fertilizers. However, there was some indication that there was an increased response after years of continuous cropping. The Camballin soil profile is mildly alkaline to alkaline (pH 7.5 - 8.5) at the surface and shows a slight increase in pH with depth.

Experiments at Kunuriurra in the East Kimberley have shown that Cununurra clay is suitable not only for rice-growing but also for sugar cane, cotton, and sorghum. Irrigated pastures have also been grown with some success. At Kununurra both phosphorus and nitrogen fertilizers are essential for soil under irrigation. In general terms, it would seem that the Camballin area would be suitable for production of crops if managed similarly to those at Kimberley Research Station (Churchward and Bettenay, 1962).

2.4 Vegetation

Before irrigation development, the area was described as Mitchell grass-ribbon grass pasture land, referred to locally as "frontage" or "flood plain country", with or without scattered trees and shrubs. The principal grasses are ribbon grass (Chrysopogon fallax), blue grass (Dichanthium spp.) and Mitchell grass (Astrebla spp.). The area is regarded as one of the richest grazing areas of the Kimberley region.

After irrigation, some native grass species have become troublesome weeds. The most serious are barnyard grass (Echinochloa colona) and potato weed (Ipomea sp.). Nut grass (Cyperus sp.) is wide spread on the verges and drains.

2.5 Irrigation

The Fitzroy River usually ceases to flow during the dry season about mid-June and commencing to flow in late December. Storing water is the main prerequisite for successful irrigation at Camballin. During the 1960's water was supplied from two storage structures installed by the State Government. These are:

1. A steel barrage across the Fitzroy River, which collapses automatically under flood conditions. As the river flow lessens the barrage is raised to redirect water into the 17 Mile Dam on the Uralla Creek. This barrage stores an estimated 4.58 x 106 cubic metres of water.
2. The 17-Mile dam, completed in 1957. This storage dam holds about 5.40 x 106 cubic metres of water. As this reservoir is shallow, much of the water is lost through evaporation unless used early in the dry season. Assuming losses of 50 per cent, the total amount of stored water was sufficient to grow 900 hectares of dry season crops.

A 17 kilometre levee was built in 1980 on the northern side of the Fitzroy River to contain floods. Before the levee was built, the Fitzroy River could flood up to 32

kilometres wide, covering the Camballin farming area to a considerable depth causing frequent damage to access roads, banks, channel stops and supply channels.

A major flood in 1983 damaged the levee and destroyed the largest, intensive grain sorghum operation ever undertaken in the West Kimberley.

2.6 Commercial Cropping Activities

Northern Developments Pty. Ltd., a company incorporated in Sydney in 1951 began small scale rice production from 1952. In 1955, a good crop from 32 ha demonstrated that commercial rice production was feasible if water were available. Subsequently the Government agreed to undertake works on the Fitzroy River which would provide 3,360 megalitres of water, sufficient to irrigate 280 ha of rice.

In 1957 the Northern Developments Pty. Ltd. Agreement Act was signed and the Company undertook to grow rice on up to 8,000 hectares of land leased from Liveringa station, while the Government undertook to provide water storage and control works to ensure adequate water for rice growing. The original 17 Mile Dam on Uralla Creek, completed in late 1957 by the Public Works Department was severely damaged by flood waters in January 1958. Prompt repairs made it possible to plant 190 ha of crop during the 1958 dry season (July to November inclusive).

In 1958, 480 hectares were prepared for the first major wet season plantings but extensive flooding in January 1959 damaged all banks, channels and drainage ditches. Again repairs enabled approximately half the prepared area to be planted.

In 1962 the company acquired a controlling interest in the Kimberley pastoral Company and hence in Liveringa station which bordered the irrigation area. With this acquisition the irrigation project was mainly geared to the provision of fodder and grazing facilities for station stock.

The total area planted by Northern Development Pty. Ltd. increased steadily to 640 hectares in 1963 but this included considerable areas of fodder sorghum. The rice crops planted by Northern Development Pty. Ltd. did not exceed 1,280 ha in any wet season. Yields were generally disappointing despite the introduction of improved varieties.

In 1969 the Australian Land and Cattle Company (ALCCO) took over the former Northern Development Pty. Ltd. holdings at Liveringa and until 1983 attempted to grow grain and fodder sorghums. The peak area sown was in 1973 when 1,933 ha were planted. Later crops were very small. While grain sorghum has been grown for at least ten years on a small scale basis none has been exported. The grain has been used for cattle feed.

2.7 Research Activities by the Department of Agriculture

The Department of Agriculture's involvement with the Camballin Irrigation Area began after the rice cropping venture by the Northern Development Company had already begun. The Company invited the Department to set up an experimental area within the potential rice growing area. In December 1958 a field assistant was appointed to Camballin to carry out a limited programme of rice experimental work.

The experimental trials were designed and supervised by officers stationed at Derby and Perth and were aimed at solving specific problems encountered in the commercial operation. The routine work involved selection of suitable varieties, derining optimum planting dates, testing for fertilizer responses, defining suitable cultural practices, monitoring and eradicating pests and weeds.

The Department had to rely on the Company for machinery and water supply. The water supply was not reliable in the dry season and floods regularly damaged supply channels and banks leaving the area flooded during the wet season. Heavy weed infestation and damage by birds compounded the problem. A large number of trials had to be abandoned before completion. Remoteness and lack of staff to give constant attention resulted in severe crop damage since the early signs of damage were not recognized.

The research activites were carried out parallel to the sequence in commercial operation. These were rice, fodder crops and grain sorghum. The main research on fodder crops was on fodder sorghum with some research on legume species. Other types of crops are summarized in the last section of this chapter. The following description summarizes the trials listed in this report (pp 17-18).

3. Brief Description of Research Programmes

3.1 RICE

Early attempts at rice growing in the Camballin area were undertaken by Kim Durack in 1951/52, on an area of clay soil forming part of the Liveringa flood plain. Water for the project was pumped from a pool in Uralla Creek, an anabranch of the Fitzroy River.

The first large scale planting of rice at Camballin was in 1958/59, when approximately 400 hectares were planted. The Department of Agriculture also commenced field trials at Camballin in 1958 using a portion of the Northern Development Company's area (Figure 1) and relying almost entirely on the Company for equipment. The research emphasis was on testing new varieties, times of planting, fertilizer responses, and irrigation management.

3.1.1 Varieties and Times of Planting

In 1951/52, four semi-long grained American rice varieties, Magnolia, Zenith, Rexoro and Century Patna, were planted as early dry season crops. All four appeared to be out of season and did not yield well.

About 32 hectares of Caloro, a short grained Japonica variety were planted as a dry season crop in June 1955 following winter rains. The crop grew well and was harvested in late October and early November. Yield was reported to be over five tonnes per hectare.

The first large scale planting of rice at Camballin in 1958/59 utilized the varieties Magnolia and Zenith on about 400 hectares. The best yields achieved were 2.8 tonnes/ha with Magnolia and 3.3 tonnes/ha with Zenith. A small scale planting of Cairose yielded approximately 2.8 tonnes/ha. Magnolia and Zenith were maintained as the standard varieties and the others abandoned. Reasonable yields from Magnolia and Zenith were only achieved in one season. Subsequent yields were appreciably lower. These varieties did not appear to be adaptable to planting in January and early February, a restriction imposed by the uncertainty of water supplies at other times. Crops planted after mid-February also ran into cold weather at flowering, resulting in high sterility counts.

Several varieties were tested on the experimental area run by the Department of Agriculture. Varieties Sigadis, Taichu 65, KI-53, and A36-3 were selected for further trials together with Magnolia and Zenith. Results from all these were highly erratic, complicated by heavy weed infestation, severe bird damage and irregular water supply.

In the 1962/63 wet season, variety HD19 obtained from Kimberley Research Station was planted on December 26, 1962 and January 25, 1963. The first planting yielded 4.7 tonnes/ha. The calculated yield after adjusting for losses was 5.8 tonnes per hectare, suggesting very high potential. The second planting yielded 3.6 tonnes per hectare.

In 1963/64, the variety HD19 was planted in bulk plots in a comparison trial with HD18 (Sirena) at three different times of planting, viz. December 1, January 1 and February 1.

The December planting was overrun by weeds but the January and February plantings grew well. HD19 performed better than HDI8 although all plots were destroyed by brolgas in the final 10 days before harvest.

A planting of the variety Sigadis yielded 1.8 tonnes/ha in 1964. The low yield was attributed to heavy weed infestation and grasshopper damage. In earlier trials, Sigadis yield figures ranged from 0.65 torines/ha when planted in March to 5.9 tonnes/ha when planted in late January.

In 1966, bacterial blight was found in rice on the Ord River irrigation area near Kununurra in the East Kimberly. As rice grown at Camballin from seed obtained from Ord River was also infected, most rice trials during 1966 wet season had to be abandoned. The following year heavy rains in January caused torrential floc,ds destroying the main irrigation channels and banks rendering irrigation impossible.

High yielding rice varieties from the International Rice Research Institute in the Philippines were obtained in 1968 and tested in small scale plots. Flooding in the same year again halted irrigation and trial results were inconclusive. The Northern Development Company then decided to abandon rice production except on an experimental basis. By 1970 some varieties such as 1R8 and IR9 gave indications of adapting well and producing high yields. However, the Australian Land and Cattle Company which took over the Northern Development Company in 1969 shifted its cropping emphasis to fodder and grain sorghum production. All rice experiments stopped in 1970 when the Department of Agriculture withdrew its technical staff from Camballin.

3.1.2 Fertilisers

Nitrogen and Phosphorus Requirement

Results from fertilizer trials at Camballin have been inconclusive. In the early years, crop yields were variable due to unsuitable varieties, and trials were complicated by bird and grasshopper damage, heavy weed infestation, plus the ever present problems caused by flooding and poor reliability of water supplies.

A series of nitrogen and phosphorus trials conducted from 1958-1961 indicated significant responses to nitrogen fertilizers, but no significant response was obtained to phosphorus or its interaction with nitrogen. In 1963, using the rice variety Hi~l9, a response was obtained to nitrogen but not to phosphorus. An application of 126 kg/ha urea resulted in an average yield of 3.87 tonnes/ha while a double application resulted in a yield of 5.6 tonnes/ha. The source of Phosphorus used was superphosphate which was applied at a rate of 252 kg/ha compared with a control of no superphosphate. A 1964/65 trial with HD19 showed that an application of superphosphate could increase yields in areas cropped for several years.

Sources of Nitrogen

A number of trials were conductecd to compare two different nitrogen sources: urea (48 per cent nitrogen) and ammonium sulphate (21 per cent nitrogen). Considerable savings on freight costs could be made if urea was used in place of ammonium sulphate. Early

comparisons of urea and ammonium sulphate were inconclusive. In the 1960/61 season, a trial using the rice variety Magnolia yielded 1719 kg/ha when urea was applied at 126 kg/ha and 1685 kg/ha when the application rate for ammonium sulphate was 256 kg/ha. One trial in the 1964/65 season indicated that there was little difference between the two sources of nitrogen.

Depth of Placement of Nitrogen

Nitrogen fertilizers applied with seed and subjected to a series of wetting and drying cycles during crop establishment are rapidly nitrified by soil bacteria into the nitrate form which is less available to rice plants and is quickly lost by denitrification during permanent flooding. Deep placement of fertilizer may overcome this problem in some types of soils.

In the 1959/60 trials at Camballin, no significant difference was obtained between urea placed at depths of 2.5 cm and 7.5 cm. This was attributed in part to an uneven plant stand. In 1960/61 trial responses to nitrogen and depth of placement were highly significant with the deeper placements giving a greater response.

3.1.3 Irrigation Management

Depth of Permanent Flooding

Commercial irrigation practice at Camballin favoured depth of at least 20 cm of water covering irrigated land whenever possible. Trials were carried out to determine whether shallower water applied to crops would decrease yields. The 1959/60 trial showed no significant difference between shallow and deep water. In 1960/61, crops were grown in 10 cm and 20 cm water. The 10 cm treatment yielded 1806 kg/ha while the 20 cm treatment yielded 1958 kg/ha. However, the maintenance of constant water depths was too uncertain to place reliance on the results obtained.

Time of Draining

Commercial practice dictates that grain should be harvested at a moisture content of between 18 and 22 per cent if sun-cracking is to be avoided. Permanent water must be drained sufficiently early so that the soil will be sufficiently dry for harvesting. Yield and milling quality may be reduced if the soils are allowed to dry too early. A compromise had to be reached between the demands for high moisture content and accessibility for harvesting machinery.

In an effort to minimize sun-cracking and at the same time obtain maximum yields, a time of drainage trial was carried out at Camballin in the 1964/65 season. Draining was done at full flowering stage, milk stage, hard dough stage and at full maturity. The results were inconclusive but earlier drainage appeared possible without loss of yield.

3.2 Fodder Crops

Fodder crops were sown as well as rice at Camballin as early as 1958. Originally they were mainly grown for horse feed. By 1962, rice yields were disappointing so the company concentrated more on fodder crops. A demand for baled hay existed to supply

cattle ships leaving Derby. By producing baled hay at Camballin, the need to transport hay from the south of the State could be eliminated.

3.2.1 Fodder Species

The first fodder crop grown at Camballin was Sudan grass (Sorghum sudanense) in 1958. A number of both grass and legume fodder species were tested by the Department of Agriculture at Camballin after 1960. Most species except sorghum did not perform well, due principally to poor establishment and heavy weed infestation. The dark cracking clay produced a waterlogged seedbed during the wet season and a crusted and cracked seedbed after irrigation during the dry season. Low temperatures during June and July also caused poor emergence. Time of planting was therefore a crucial factor determining the success of establishment. Species with slow growth rates such as non-climbing legumes, were unable to compete with weeds.

In spite of poor stands in the plant introduction trials, there were indications that many tropical species could grow at Camballin, particularly cowpeas, millets, green panic, Macroptilium spp. and Clitoria spp.

3.2.2 Fodder Sorghums

Due to their rapid growth rates and high degree of tolerance to drought, sorghum spp., competed successfully with weeds and established well in the area. Besides Sudan grass, other sotghums tested were Sorghum almurn, S. bicolor (sweet sorghum cv. Sugardrip), and Sudax (S. sudanense x S. bicolor).

Sudax and Sudan grass appeared to perform better than S. almum in both quantity and quality. In 1968, under dry season conditions, Sudan grass and Sudax yielded an average of five tonnes of air-dry hay per hectare. Sorghum bicolor, variety Sugardrip, also grew well, yielding 6.7 tonnes per hectare but was difficult to harvest and bale as hay.

3.2.3 Fodder Sorghums and Legumes Mixtures

Attempts to produce fodder mixtures of sorghums and legumes did not meet with success because of the poor establishment of legumes. In January 1967, Sudan grass, Sudax, and Sugardrip sorghum were grown in combinations with Phasey bean (Macroptilium lathyroides), Cooper glycine (Neonotonia wightii), and lablab bean (Lablab purpureus). Only Phasey bean appeared to be able to survive in association with the sorghums. Dry matter of the legumes in the hay was negligible. Weeds constituted a considerable proportion of the hay produced (from 15 to 30 per cent).

3.3 Grain Sorghum

Since fodder sorghum was successfully grown at Camballin, grain sorghum was also recognized as a suitable crop awaiting potential demand. A number of trials were carried out after 1960 to select suitable varieties. High yielding varieties in the early period were Alpha, Kalo and Brolga. American hybrid species were introduced in 1966. The most

promising were the Texas varieties with Texas 610 adapting best to the area. By 1970, the Texas 610 still performed better than the new varieties and hybrids.

Production problems of grain sorghum at Camballin were similar to those of fodder sorghum. The cracking and crusting of the seedbed caused poor emergence and poor plant stands. Trials on planting methods indicated that a ridge and furrow system reduced the problem and improved plant stands over the pasture furrow system.

Another major problem associated with grain production at Camballin was damage to grain caused by grasshoppers and birds. The most troublesome birds were magpie geese, little corellas, star finches and crows. The magpie geese mainly attacked the borders and therefore had a serious effect on small plot trials except when sufficient border rows were provided. The corellas often settled on the sorghum heads and attacked the most mature areas. Star finches caused damage (similar to grasshoppers) to grain at the milk stage and provided susceptible sites for mould in the event of late rain. Crows were a problem when present in large numbers. When humidity was low the seed heads were easily shattered by the activities of birds.

Rains and the irrigation water supply dictated the time of planting. In the wet season, planting was difficult, however, wet season crops could be recycled for a second harvest. The variety NK 275 planted in March 1970, produced 4.5 tonnes of grain per hectare at the first harvest in May. When sufficient irrigation for regrowth was applied the crop produced 6.7 tonnes per hectare at the second harvest in September.

3.4 Other Crops

Besides sorghum and legumes, oats were grown to provide hay for horse feed. Later, grain production was possible. Wheat and barley were then subsequently planted but grain yields were too low to warrant commercial production. Attempts were made to introduce new varieties, find a suitable time for planting and suitable rates of fertilizers but little improvement was gained. The recurring problems were poor emergence from crusting of the soil surface, unreliable water supply and heavy weed infestation. Trials on temperate cereals had ceased by 1967.

Safflower and linseed crops planted between 1958 and 1962 were unsuccessful.

Following the success of cotton at Kimberley Research Station, Kununurra cotton was tested at Camballin during the 1961 and 1962 seasons. Insects proved too troublesome and returns from cotton were uneconomic, hence experimental work with cotton did not proceed.

4. Index of Trials at Camballine

4.1 Rice

1. Effect of split applications of nitrogen (urea) on wet season rice.
2. Production of pure seed from rice varieties.
3. Effect of a split application of nitrogen (urea) on dry season rice.
4. Herbicides for control of weeds in channels used to irrigate rice.
5. Herbicides for control of weeds in rice.
6. Effect on rice yields of planting time and rates of nitrogen and phosphorus.
7. Effect of time of drainage on yields and grain quality of rice.
8. Increasing the seed supplies of several rice varieties.
9. Effect of times of planting on rice yields.
10. Effect of a split application of nitrogen (urea) on rice yields.
11. Response of rice at Camballin to urea, ammonium sulphate and phosphorus.
12. Effect of time of drainage on yields and grain quality of rice.
13. Effect of potassium and mid-summer drainage on yield of a wet season crop of rice.
14. Evaluation of the growth and development of a range of rice varieties planted in the wet season.
15. Management of a wet season crop of rice.
16. Evaluation of the growth and development of a range of rice varieties planted in the wet season.
17. Effect of aerial seeding (simulated) on rice establishment.
18. Effect of a split application of nitrogen (urea) on yields of three rice varieties.
19. Evaluation of the growth and development of a range of rice varieties.

4.2 Fodder Crops

1. Effect of separate and combined applications of nitrogen and phosphorus on yield of fodder crops.
2. Effect of separate and combined applications of nitrogen and phosphorus on yield of Sudan grass.
3. Effect of different seeding rates on yield of Sudan grass.
4. Performance of Sudan grass in legume mixtures.
5. The performance of mixtures of (Sorghum almum) and legume species.

6. Effect of separate and combined applications of nitrogen and phosphorus on yield of Sudan grass.
7. The emergence, growth and development of wet season fodder crops.
8. Effect of nitrogen and pasture renovations on yield and hay quality of Sudan grass.
9. The performance of Sudax, Siratro and a Hamel grass-Siratro mixture.
10. Effect on yield of Sudan grass of cutting at various stages of growth.
11. The wet season performance of sorghum species.
12. Wet season production of four varieties of sorghum.
13. Comparison of different fodder sorghums.
14. The performance of mixtures of sorghum and legume species.
15. Dry season response of Sudax to different rates of nitrogen and phosphorus.
16. Effect of increasing rates of nitrogen on yields of Sudax.

4.3 Grain Sorghum

1. Comparison of two varieties of grain sorghum.
2. Comparison of seeding rates of saccaline sorghum.
3. Comparison of five varieties of grain sorghums during the wet season.
4. Comparisons of grain sorghum varieties during dry season under different irrigation systems.
5. Dry season production of grain sorghum.
6. Phosphorus requirement of grain sorghum under pasture furrow irrigation.
7. Effect of different methods of planting and seedbed preparation on emergence of grain sorghum.
8. Comparison of grain sorghum varieties grown during the wet season.

4.4 Other Crops

1. The development and yield of oats on Camballin black soil.
2. Effect on oat yields of irrigating before seeding at two rates.
3. Comparison of grain yields of two varieties of oats.
4. Effect of time and rate of seeding on yields of wheat.
5. Comparison of oat grain and hay yields from two planting dates.
6. Comparison of the development and yields of varieties of oats and wheat grown under irrigation.

7. Grain and hay production of oats.
8. Effect of separate and combined applications of nitrogen and phosphorus on the development and yield of oats.
9. Effect of urea and ammonium sulphate (applied at two depths) on oat yields.
10. Performance of three oat varieties grown under irrigation.
11. Comparison of the development and yields of varieties of wheat, oats and barley grown under irrigation.

4.5 Rice

4.5.1 Effect of split applications of nitrogen (urea) on wet season rice.

TRIAL NO: 61DB1

PERSONNEL: Fitzgerald K., Thomas D.W.

LOCATION: Camballin irrigated rice area, block H, bay 1-3

ABSTRACT:

Aim: To test the hypothesis that split applications of urea increase yields of rice.

Result:

Nitrogen Rates (kg/ha)	Mean grain yield (kg/ha)
63 + 31 + 31	991
63 + 63 + 0	1046
63 + 0 + 63	1100
125	1353
188	1597
	LSD (P= 0.05) = 201

Split application of urea with an initial application of 63 kg/ha did not increase yields of rice.

TREATMENT:

Time of fertilizer application	:	1. At seeding
		2. 7 days before flowering
		3. 7 days after flowering
Fertiliser rates:	:	Urea at 63, 31, 125, 188 kg/ha
Number of applications	:	6
Plot size	:	6 drill widths (6 x 2.13 m) x 20 m
Variety	:	Magnolia
Seeding rate	:	176 kg/ha
Planting date	:	13/1/61

MEASUREMENT: Emergence date, flowering date, maturity date, percentage of sterility, plant height at maturity, grain yield.

FILE NO: 1320 EX

4.5.2. Production of pure seed from rice varieties.

TRIAL NO:	62DB2
PERSONNEL:	Fitzgerald K.
LOCATION:	Camballin Experimental Area, Block F2, F3
ABSTRACT:	This trial aimed to maintain pure seed supplies of the commercial rice varieties Magnolia and Zenith and produce sufficient pure seed of Sigadis, Taichu 65, A36-3 and K1-53 for commercial sowings.
TREATMENT:	Seed selected from each of the six varieties was planted in a 20 m row. Row spacing was 30 cm. Rows were rejected if off-types or red grain appeared on any one plant in the row. Twenty heads were selected from the centre row of each group, for replanting the next year. The remaining seed was harvested for bulking and sown in the 1962 season accumulation plot. This procedure was to be repeated in all following seasons to supply pure seed of each of the varieties.
FILE NO:	122 EX

4.5.3. Effect of a split application of nitrogen (urea) on dry-season rice.

TRIAL NO: 62DB3

PERSONNEL: Fitzgerald K.

LOCATION: Camballin

ABSTRACT: Aim: To determine the effect of a split application of nitrogen on dry season rice at Camballin

Result: No results available

TREATMENT:

Variety : Caloro

Seeding rate : 157 kg/ha

Fertilizer : Urea was initially placed at 7.5 cm; later application was by hand.

1. 188 kg/ha at planting.
2. 126 kg/ha at planting + 63 kg/ha at 50 days after planting.
3. 126 kg/ha at planting + 63 kg/ha at flowering.
4. 126 kg/ha at planting + 63 kg/ha at one week after flowering.

Plot size : Each treatment occupied 2 drill widths (2 x 2.13 m) across a commercial bay.

MEASUREMENT: Emergence date, flowering date, maturity date, per cent sterility, grain yield.

FILE NO: 1320 EX

4.5.4. Herbicides for control of weeds in channels used to irrigate rice.

TRIAL NO: 63DB6

PERSONNEL: Fitzgerald K.

LOCATION: Camballin Experimental Area; Block C2

ABSTRACT: Aim: To test the effectiveness of various herbicides for the control of weeds in channels used for irrigating rice.

Result: No results available.

TREATMENT:

Herbicides : Applied two weeks before planting. Channels were flushed before irrigating crop.

1. 13.5 kg 80% Monuron in 1800 L water/ha
2. 27 kg 80% Monuron in 1800 L water/ha
3. 13.5 kg 50% Atrazine in 1800 L water/ha
4. 27 kg 50% Atrazine in 1800 L water/ha
5. 11.25 kg 85% DPA + 33 L Weedajol TL in
6. 22.5 kg 85% DPA + 66 L Weedajol TL in 1800
7. Control

Plot size : 25 sq.m.

Number of replications : 3

FILE NO: Unknown

4.5.5. Herbicides for control of weeds in rice.

TRIAL NO: 63DB7

PERSONNEL: Fitzgerald K.

LOCATION: Cambellin Experimental Area, Block C2

ABSTRACT: Aim: To test the effectiveness of two herbicides for the control of weeds in rice

Result: No results available

TREATMENT:

Rice Variety : HD19 Seeding rate: 112 kg/ha.

Herbacides : Applied at 2-3 leaf stage, two weeks before permanent watering:-

1. 4 kg a.i. STAM F34 in 727 L water/ha
2. 8 " " " " " " " " "
3. 4.5 " " " " " " " " "
4. 9 " " " " " " " " "
5. 1 " " " " " " " " "
6. 2 " " " " " " " " "
7. Control

Plot size : 25 sq.m.

Number of replications : 4

Fertiliser : 126 kg/ha urea

FILE NO: Unknown

4.5.6. Effect on rice yields of planting times and rates of nitrogen and phosphorus.

TRIAL NO: 63DB8

PERSONNEL: Fitzgerald K.

LOCATION: Camballin Rice Area

ABSTRACT: Aim: To compare yields of two varieties of rice planted at three different times and with different levels of nitrogen and phosphorus.

Result: No results available

TREATMENT:

Varieties and Sowing rates	:	1.	HD18 84 kg/ha
	:	2.	HD19 157
Sowing dates	:	1.	December 1, 1963
	:	2.	January 1, 1964
		3.	February 1, 1964
Fertiliser rates	:	Urea: 63, 126, 189, 152 kg/ha;	
	:	Superphosphate: 0, 126 kg/ha	

MEASUREMENT: Maturity dates, yields, straw strength, sterility, growth and development

FILE NO: 949 EX

4.5.7. Effect of time of drainage on yields and grain quality of rice.

TRIAL NO: 65DB4

PERSONNEL: Fitzgerald K., Hodson J.

LOCATION: Camballin Rice Area

ABSTRACT:

Aim: To assess the effect of time of drainage on yields and grain quality of rice variety HD19.

Result: Yields were low due to severe competition from Barnyard grass (Echinochloa spp) . No treatment caused lodging or haying off. The percentage of empty glumes was normal. Grain yields and weight were not affected by drainage time

Early drainage on this soil would allow an earlier harvest, since the soil would support heavy machinery and the rice could be harvested at a higher moisture content. This should reduce the percentage of sun cracked grain and improve the mill return.

Drainage time	Yield (kg/ha)	Empty glumes (%)	1000 grain wt. (g)
May 25	1757	12.4	25.4
June 9	1868	8.9	25.4
June 9	1417	-	-
June 16	1161	7.2	24.7

TREATMENT:

Variety : HD19

Planting date 31/1/65

Seeding rate : 112 kg/ha using seed drill

Plot size : One bay per treatment (about 0.4 ha)

Draining time: :
1. Late flowering 25/5/65 bay G2
2. Milk stage 9/6/65 bay G3
3. Late dough stage 9/6/65 bay G4
4. Full maturity 16/6/65 bay G5

Fertilisers : 189 kg/ha urea at 7.5 cm depth before seeding; 126 kg/ha superphosphate at seeding.

Irrigation : Water was applied five times after seeding until 22/2/65 when permanent depth was maintained

Measurement: Yields and grain quality

File No: 947 EX

4.5.8. Increasing the seed supplies of several rice varieties.

TRIAL NO: 63DB4

PERSONNEL: Fitzgerald K.

LOCATION: Camballin Experimental Area

ABSTRACT: This trial aimed to bulk up seed supplies of several productive rice varieties (viz. Sigadis, Taichu and Kl-53) and to observe their phenology in the field.

TREATMENT:

Planting dates	:	December 1963
Varieties	:	Sigadis, Taichu, Kl-53
Seeding rate	:	112 kg/ha at 2.5 cm
Fertilisers	:	189 kg/ha urea at 7.5 cm before seeding
Irrigation	:	Draining when 75% is at milky stage
Plot size	:	Each variety occupied 1/3 of a bay
Harvest	:	When grain reached 22-23% moisture

MEASUREMENT: Germination dates, flowering dates, yields, development.

FILE NO: 1122 EX

4.5.9. Effect of times of planting on rice yields.

TRIAL NO: 65DB5

PERSONNEL: Fitzgerald K., Hodson J.

LOCATION: Camballin Rice Area, Block F and G

ABSTRACT:

Aim: To compare yields of three varieties (HD18, HD19 and Belle Patna) of rice planted at different times at Camballin.

Result: Belle Patna grew poorly and was not harvested. Empty glume count was 54 per cent. Effects of planting time depended on the availability of water. Belle Patna matured in 124 days, c.f. 141 days of HD varieties, and appeared unsuitable for Camballin.

	Grain Yield (kg/ha)	
Varieties	**First Planting**	**Second Planting**
HD18	1580	1159
HD19	1102	1374

TREATMENT:

Varieties : HD18 (Sircna), HD19 and Belle Patna

Planting dates 31/1/65 HD18 in bay F4, HD19 in bay F5

17/2/65 HD18 in bay F2, HD19 in bay Fl

: Due to small quantity of Belle Patna seed, it was planted in a bird-proof cage

Seeding rate : 112 kg/ha using seed drills at 2.5 cm

Plot size : One bay per treatment

Cultural practice : The area was deeply ploughed, levelled, pre-irrigated andcultivated for weed control. 20 cm permanent water was maintained when plants were nearly 30 cm high. 63 kg/ha superphosphate was applied with seed. 126 kg/ha urea was placed at 7.5 cm before seeding.

MEASUREMENT: Maturity data, grain yields, straw strength, per cent sterility, growth and development

FILE NO: 949EX

4.5.10. Effect of a split application of nitrogen (urea) on rice yields.

TRIAL NO: 65DB6

PERSONNEL: Fitzgerald K.

LOCATION: Camballin Experimental Area

ABSTRACT:

Aim: To compare yields from rice crops receiving single or split applications of nitrogen.

Result: No results available.

TREATMENT:

Varietiy : HD19

Fertiliser rates:

1. 103 kg/ha urea at planting
2. 53 " " " " " + 53 kg/ha at flowering.

Basal dressing of 126 kg/ha superphosphate was applied.

Plot size : One bay divided in half.

Cultural practice : The area was prepared before the wet season and weeds eliminated by pre-irrigation and cultivation. Banks and channels were kept clear of weeds. Permanent water was maintained at 20 cm up to the time of drainage at late flowering stage.

Planting date : December 1965

MEASUREMENT: Flowering date, maturity date, yield.

FILE NO: Unknown

4.5.11. Response of rice at Camballin to urea, ammonium sulphate and phosphorus.

TRIAL NO: 65DB7

PERSONNEL: Fitzgerald K., Hodson J.

LOCATION: Camballin Experimental Area, Block F5

ABSTRACT:

Aim: To assess the response of rice to two sources of nitrogen (urea and ammonium sulphate) and to superphosphate.

Result: High rates of ammoniurn sulphate decreased grain weight. The percentage of empty glumes was low. Ammonium sulphate gave higher yields than urea. The response to superphosphate was small.

Conclusion: High rates of nitrogen increase rice yields but the response to phosphorus was negligible.

TREATMENT:

Variety : HD19

Fertilisers : Phosphorus: 0 and 189 kg/ha superphosphate applied with seed. Nitrogen: 252 kg/ha urea; 347 and 693 kg/ha ammonium sulphate. Nitrogen was applied at 7.5 cm before seeding.

Cultural practice : The area was prepared before the set season. Weeds were eliminated by pre-irrigation and cultivation. Permanent water was maintained at a level of 20 cm.

Planting date : 31/1/65

MEASUREMENT: Flowering date, maturity date, yield, grain quality data.

FILE NO: 948 EX

4.5.12. Effect of time of drainage on yields and grain quality of rice.

TRIAL NO: 66DB3

PERSONNEL: Fitzgerald K., Hodson J.

LOCATION: Camballin Experimental Area

ABSTRACT:

Aim: To assess the effect of time of drainage on yield and grain quality of rice

Result: The trial was cancelled because bacterial blight infected the area.

TREATMENT:

Variety	:	HD19
Seeding rate		134 kg/ha using seed drill
Drainage times		Early flowering; Late flowering; Milk stage; Late dough stage; Full maturity.
Plot size	:	Each drainage treatment occupied one bay.
Fertilisers	:	125 kg/ha superphosphate, applied with seed; 189 kg/ha urea at 7.5 cm before seeding.

MEASUREMENT: Number of days to maturity, yields, moisture content.

FILE NO: 947 EX

4.5.13. Effect of potassium and a mid-summer drainage on yield of a wet season crop of rice.

TRIAL NO: 67DB3

PERSONNEL: Fitzgerald K.

LOCATION: Camballin Experimental Area, Block G2 and G3

ABSTRACT:

Aim: To determine the effect of potassium and a mid-summer drainage on yield of a wet season crop of HD19 rice. A mid-summer drainage may increase yields by decreasing levels of organic acids, methane, hydrogen sulphide and carbon dioxide, which may cause root rot and inhibit nutrient uptake.

Result: Flooding from mid January to mid February destroyed irrigation channels. Bays were drained until irrigation was available (April 21), but the plants had been water stressed and their condition was poor. No response to potassium was evident and flowering started on May 25. The trial was abandoned in June.

TREATMENT:

Planting date	:	10/1/67
Variety		HD19
Seeding rate		112 kg/ha using seed drill
Fertilisers	:	252 kg/ha at 7.5 cm before seeding. 126 kg/ha superphosphate applied with seed. 189 kg/ha potassium sulphate.
Draining treatments	:	1. Control, Bay G2
	:	2. Mid-season draining with potassium. Half Bay G3
	:	3. Mid-season draining without potassium. Half Bay G3
Irrigation	:	Water was applied regularly until the plants were 20 cm tall when a permanent water level was maintained. Water was drained from treatments two and three at late tillering for 10 days and reapplied. Final drainage was 20 to 25 days after full flowering.

MEASUREMENT: Flowering date, maturity date, grain yield

FILE NO: Unknown

4.5.14. Evaluation of the growth and development of a range of rice varieties planted in the wet season.

TRIAL NO: 67DB4

PERSONNEL: Fitzgerald K.

LOCATION: Camballin Experimental Area (Bird-proof cage)

ABSTRACT: Aim: To study the growth and development of twenty rice varieties planted during the wet season.

Result:

Varieties		Flowering date	Maturity date
IR32-38-2	26	March 16	-
1R5-47-2	42	No	-
1R9-60	38	No	-
Irl4-149-3	54	March 25	-
8573-A4-20-6	50	March 16	April 7
268B-PR-8-].-1	18	May 19	-
2218-57-1-4	50	March 2	-
Dawn	81	March 16	April 7
Tainani		March 16	April 7
Taichung (Native) 1	94	No	-
Ch242 x Cl-9l55	30	March 16	-
Takao No. 21	44	March 16	April 20
Remadja	13	No	-
Hsinchu 56	11	March 16	-
Dee-Geo-Woo-Gen	11	No	-
Lacrosse	3	No	April 7
Rexoro Red x Unknown	25	March 2	April 7
Tainan 3		March 16	-
Yanco Research Long (YRL)	17	March 16	April 7

Result: (Cont.)

Varieties	1000 grain weight g.	No. of panicle / plant	Seed weight / panicle g.	glumes
IR32-38-2	-	-	-	-
1R5-47-2	-	-	-	-
1R9-60	-	-	-	-
IR14-149-3	-	-	-	-
8573-A4-20-6	3.67	7	2.7	88
268B-PR-8-l-1	-	-	-	-
2218-57-1-4	-	-	-	-
Dawn	-	3	-	100
Tainani	-	5	0.3	92
Segadis	-	-	-	-
Ch242 x C1-9l55	-	-	-	-
Takao No. 21	-	14	0.6	68
Remadja	-	-	-	-
Hsinchu 56	-	-	-	-
Dee-Geo-Woo-Gen	-	-	-	-
Lacrosse	10.12	11	25.4	30
Rexoro Red x Unknown	11.67	8	10.6	42
Tainan3	-	-	-	-
Yanco Research Long (YRL)	-	14	-	100

Flooding from late January to mid-March damaged the irrigation channels. The plants gradually died from water stress.

TREATMENT:

Planting date : 20/12/66

Varieties : 20 varieties

Method of planting	:	Seed was planted in tins and watered by sprinkler daily until transplanted into a permanent flooded section of the bird-proof cage on 18/1/67. Another set of replicates with the Belle Patna variety and Sigadis variety were dry seeded into the cage on 12/1/67 and watered the next day.
Plot size	:	Each variety consisted of 3 rows, 195 cm long with 30 cm spacing between rows and 15 cm plant spacing.
Fertilisers	:	52 kg/ha urea at 7.5 cm was applied before transplanting. 126 kg/ha superphosphate was broadcast by hand before flooding.
Herbicide	:	Ordram at 4.5 kg/ha.
Insecticide	:	Dieldrin for grasshoppers.

MEASUREMENT: Flowering dates, tiller counts, maturity dates, sterility counts, growth and development, yields.

FILE NO: 973 EX

4.5.15. Management of a wet season crop of rice.

TRIAL NO: 68DB2

PERSONNEL: Fitzgerald K.

LOCATION: Camballin Experimental Area, Block G

ABSTRACT:

Aim: To demonstrate management of a wet season crop of rice at Camballin.

Result: Flowering commenced on 27/3/68, 70 days after the first watering. The crop was drained at the hard dough stage (April 17) and harvested on May 2:-

Number of samples: 14

Number of panicles from 2.1 m row: 115

Empty glumes: 10.7%

Average number of grains per panicle: 55.5

1000 grain weight corrected to 14% moisture content-20.4 g.

Yield: 2727 kg/ha

The low nitrogen rate and temporary water shortage during flowering may have reduced yield. The average number of grains per panicle was 55.5, but the maximum was 170. No mid-season yellowing was observed. Bird damage was minimal.

TREATMENT:

Variety	:	Taichung (Japonica type)
Seeding rate	:	134 kg/ha using seed drill
Fertilisers	:	252 kg/ha urea at 7.5 cm before seeding and 126 kg/ha broadcast at early flowering; 126 kg/ha superphosphate 126 kg/ha potassium (potash) applied with seed.
Cultural practice	:	Deep ploughed and repeatedly disced for a fine seedbed
Planting date	:	15/1/68
Irrigation	:	Water was applied on 17/1/68 and 30/1/68. 20 cm permanent water was applied from 13/2/68 to 17/4/68.
Weeds control	:	Sprayed with STAN F34 at 11 L/ha to control Barnyard grass.

MEASUREMENT: Emergence date, flowering date, grain yield.

FILE NO: Unknown

4.5.16. Evaluation of the growth and development of a range of rice varieties planted in the wet season.

TRIAL NO: 68DB3

PERSONNEL: Fitzgerald K., Hodson J.

LOCATION: Camballin Experimental Area (Bird-proof cage)

ABSTRACT: Aim: To study the growth and development of a number of rice varieties planted during the wet season.

Result: The original plants seeded on 16/1/68 could not compete with weeds and were abandoned. Reserved seed planted in pots on 20/1/68 and transplanted into buckets were available for observation.

Varieties	Flowering dates
Takao No. 21	March 27
IR9-60	April 22
Tainan 1	April 4
Taichung	March 27
Dee-Geo-Woo-Gen	April 22
Hsinchu 56	April 9
Igeotze	April 14
IR-5-47-2	May 5
IRl4-149-3	April 11
HD19	May 5
Chianung 242 x Cl 9155	April 14
SML 816	May 20
1R32-38-2	April 8
Belle Patna	March 23
Rexora Red x Unknown	March 22

TREATMENT:

Planting date	:	16/1/68
Harvest date	:	June 1968
Varieties	:	15
Method of planting	:	Hand seeding, one row per variety, full length of cage
Fertilisers	:	126 kg/ha superphosphate with copper and zinc and 252 kg/ha urea were drilled in before planting.
Irrigation	:	The area was flooded and drained on 18/1/68. Permanent water was applied on 20/2/68.

MEASUREMENT: Flowering dates, numbers of tillers, maturity dates, yields.
FILE NO: 973 EX

4.5.17. Effect of aerial seeding (simulated) on rice establishment.

TRIAL NO: 69DB2

PERSONNEL: Fitzgerald K.

LOCATION: Camballin Experimental Area, Field II

ABSTRACT:

Aim: To assess the effect on establishment of wetting seed before broadcasting onto shallow flooded soil.

Result: No results available.

TREATMENT:

Rice varieties	:	HD19, Taichung
Seeding rate	:	134 kg/ha
Fertiliser	:	252 kg/ha urea broadcasted at time of second watering
Cultural practice	:	The area was cultivated to prepare a fine seed bed and remove sorghum crowns. Both bays were flooded for 10 days maintaining water at 7.5 to 10 cm. A second watering was applied before the soil dried. Subsequent watering was applied when needed.
Seeding treatments	:	1. 29/1/69, 7 days of flooding, with dry seed 2. 31/1/69, 10 days of flooding, with seed soaked for 12 hours 3. 31/1/69, 10 days of flooding, with dry seed 4. Half of all rice areas was sprayed with STAN F34 the day before the second watering.

MEASUREMENT: Emergence counts, plant counts after establishment, tiller counts.

FILE NO: Unknown

4.5.18. Effect of split application of nitrogen (urea) on yields of three rice varieties.

TRIAL NO: 70DB1

PERSONNEL: Payne A.L.

LOCATION: Camballin, field 2 and 3 bulk area

ABSTRACT: Aim: To determine the effect of a split application of nitrogen on yields of three high yielding rice varieties grown at Camballin.

Result: No results available

TREATMENT:

Planting date	:	January 1970
Varieties		1R8, Taichung, Tainan
Seeding rate		134 kg/ha
Fertilisers	:	126 kg/ha superphosphate at time of seeding. 504 kg/ha urea at seeding or 252 kg/ha at seeding + 252 kg/ha 25 days before heading.
Plot size	:	Each nitrogen treatment was applied to half of one bay per replicate. Each nitrogen treatment area was divided into three varieties.
	:	

FILE NO: Unknown

4.5.19. Evaluation of the growth and development of a range of rice varieties at Camballin.

TRIAL NO: 70DB2

PERSONNEL: Payne A.L.

LOCATION: Camballin Experimental Area

ABSTRACT: Aim: To study the growth and development of a number of rice varieties grown at Camballin.

Result: No results available.

TREATMENT:

Planting date	:	8/1/70
Varieties		IR 61-10-3-1(E), IR 503-6-3-6, IR 4002845, IR 95-42-11-2, IR 5-90-1-1(6), IR 532E-576, IR 580-19-2-2, Taichung, IR8, Tainan 1.
Seeding rate		126 kg/ha
Plot size	:	One drill width (2.13 m) for each variety
Fertiliser	:	123 kg/ha superphosphate applied with tyned drill at 9 cm 518 kg/ha urea applied with tyned drill at 9 cm
Irrigation	:	Initial watering on 10/1/70.
	:	

MEASUREMENT: Emergence dates, flowering dates, harvest date, yields, incidence of pests, observations of growth and development.

FILE NO: Unknown.

4.6 FODDER CROPS

4.6.1. Effect of separate and combined applications of nitrogen and phosphorus on yield of fodder crops.

TRIAL NO: 60DB1

PERSONNEL: Fitzgerald K., Wickett J.

LOCATION: Camballin Rice Area, Block C

ABSTRACT:

Aim: To assess the effects on yield of fodder crops of separate and combined applications of nitrogen and phosphorus.

Result: Germination and establishment was poor due to waterlogging and only Clitoria survived in reasonable number. The trial was abandoned.

TREATMENT:

Planting date 23/1/60

Plot size : Each species occupied one bay, subdivided into four plots of one drill width (240 cm) and received four fertiliser treatments (NOPO, NlPl, Nl, p1)

Fertilisers : NO = No nitrogen; Nl = 63 kg/ha of urea at time of planting; ~o = No phosphorus; P1 = 126 kg/ha of superphosphate at time of planting

Species and seeding rate :

	kg/ha
1. Grain sorghum	17
2. Green panic	11
3. Sudan grass	17
4. Elephant grass 5280 plants at 60 cm x 120 cm spacing	
5. Clitoria	22
6. Sorghum almum	13
7. Cowpea	22
8. Bullrush millet	13
9. Canary grass	13
: 10. Sweet sorghum var. S.S.6	17

MEASUREMENT: Emergence date, yield at time of flowering, maturity date, yield at maturity, rainfall and irrigation, cutting and recovering.

FILE NO: 1155 EX

4.6.2. Effect of separate and combined applications of nitrogen and phosphorus on yield of Sudan grass.

TRIAL NO: 60DB1

PERSONNEL: Fitzgerald K., Wickett J.

LOCATION: Camballin Rice Area, Block C

ABSTRACT:

Aim: To assess the effects of single and combined topdressings of nitrogen and phosphorus on yield of Sudan grass after two cuts and a cultivation

Result: The trial was abandoned due to a shortage of irrigation water.

TREATMENT:

Planting date : 7/10/60

Seeding rate : 34 kg/ha

Treatments : NOPO, N1P1, Ni, P1 where:
NO = No nitrogen; Nl = 63 kg/ha of urea; PU = 63 kg/ha of phosphorus; P1 = 63 kg/ha of

Cultivation Half of the area was cultivated after cutting.

FILE NO: 1325 EX

4.6.3. Effect of seeding rates on yield of Sudan grass.

TRIAL NO: 60DB3

PERSONNEL: Fitzgerald K., Wickett J.

LOCATION: Camballin Rice Area

ABSTRACT: Aim: To determine the best seeding rate for high yields of hay from Sudan grass.

Result: Emergence started on the eighth day after seeding. Emergence counts on 25/8/60 and dry weights at flowering (9/10/60) were:-

Seeding rate (kg/ha)	17	34	51	68
Emergence (plants/sq m)	73	112	151	225
Dry weight (t/ha)	9.0	13.8	11.3	14.7

The crops were destroyed by grasshoppers before the final harvest. However, the 68 kg/ha seeding rate appeared best.

TREATMENT:

Planting date : 8/9/60

Seeding rate : 17, 34, 51, 68 kg/ha

Each treatment was drilled in one drill width (213 cm) at 2.5 cm depth. All treatments were within 2 bays (0.4 ha). 188 kg/ha of urea and 125 kg/ha of superphosphate were applied at time of seeding. Water was applied immediately after seeding.

MEASUREMENT: Emergence date, germination count, flowering date, yield at flowering, maturity date, yield at maturity.

FILE NO: 1316 EX

4.6.4. Performance of Sudan grass in legume mixtures.

TRIAL NO: 61DB3

PERSONNEL: Fitzgerald K. and Wickett J.

LOCATION: Camballin – Block A, bay 3

ABSTRACT: Aim: To observe the performance of Sudan grass in legume mixtures at Camballin.

Result: Good emergence was observed 8 days after seeding. Plant counts/sq m on 15/6/61 were:

Sudan : 68 + Clitoria : 2.2

Sudan : 40 + Phasey bean : 6.5

Sudan : 64 + Centrosema : 0

Centrosema did not germinate possibly due to the low temperatures. The stands averaged 23 cm tall at 32 days after planting and 46 cm tall at 74 days, in spite of grazing by sheep at 39 days. The trial was abandoned because of damage by sheep and wallabies.

TREATMENT:

Planting date : 18/5/61

Fertilisers : 63 kg/ha of urea broadcast by hand before seeding. 126 kg/ha of superphosphate drilled in with seed.

Plant combination and seeding rates :

1. Clitoria, 5 kg/ha + Sudan grass 34 kg/ha
2. Phasey bean, 3 kg/ha + " " " " "
3. Centrosema, 7 kg/ha + " " " " "

Irrigation was applied after seeding.

:

MEASUREMENT: Emergence date, plant counts, yields.

FILE NO: Unknown

4.6.5. The performance of mixtures of sorghum (Sorghum almum) and legume species.

TRIAL NO: 63DB2

PERSONNEL: Fitzgerald K., Wickett J.

LOCATION: Camballin Experimental Area, Block E

ABSTRACT:

Aim: To observe how different mixtures of fodder sorghum, (S. almum) and legume species perform at Camballin.

Result: First watering was on 24/12/63, followed by 60 mm rain on 31/12/63.

Germination of sorghum and the legumes was poor and weeds infested the 17 kg/ha bays.

The sorghum started flowering on 9/3/64 and heights ranged from 170 to 180 cm. Phasey bean plants started flowering on 9/3/64 and were 36 cm tall but sparse. The bays were mown on March 9, 1964, yielding:-

Bay	kg/ha	Bay	kg/ha
24a	1112	27	3228
b	556	28	3067
25a	1946	29	1775
b	1668	30	2098

The hay produced had thick stems and was of poor to average quality. The legumes may have failed due to old seed (3 years) being used, but more likely because of waterlogging and high weed densities.

The higher seeding rate of sorghum suppressed weeds and produced hay with finer stems.

TREATMENT:

Cultivation: The E Block bays were cultivated with a Ferguson 65 and tiller on 13/12/63 and land planed on 16/12/63.

Fertilisers: 126 kg/ha of urea was bonded at 7.5 cm depth before seeding.

Seeding rates (kg/ha):-

Bay	Sorghum almum	Stylosanthes	Centrosema	Siratro	Phasey bean
24a	17	5	-	-	-
24b	17	-	5		
25a	17	-	-	5	-
25b	17	-	-	-	5
27	34	5	-		
28	34	-	5	-	
29	34	-	5		
30	34	-	-	-	5

Planting date : 19/12/63

MEASUREMENT: Emergence, flowering, yields

FILE NO: 1324 EX

4.6.6. Effect of separate and combined applications of nitrogen and phosphorus on yield of Sudan grass.

TRIAL NO: 61DB2

PERSONNEL: Fitzgerald K., Wickett J.

LOCATION: Camballin Sudan Grass Area

ABSTRACT:

Aim: To measure the effects of separate and combined applications of nitrogen and phosphorus on yields of Sudan grass.

Result: The area was grazed by sheep from Liveringa Station on August 7 and 21, 1961. The trial was then abandoned.

TREATMENT:

Planting date : 18/5/61

Seeding rate : 34 kg/ha

Treatments : NOPO, NlPl, Ni, P1 where:- NO = No nitrogen

Ni = 63 kg/ha urea

P0 = No phosphorus

P1 = 63 kg/ha superphosphate

MEASUREMENT: Emergence and flowering dates, yields.

FILE NO: 1325 EX

4.6.7. The emergence, growth and development of wet season fodder crops.

TRIAL NO: 63DB3

PERSONNEL: Fitzgerald K., Wickett J.

LOCATION: Camballin Block E, bays 13-18

ABSTRACT: Aim: To observe the emergence, growth and development of a range of fodder crops at Camballin.

Result:

Species	Seeding rate kg/ha	Germination	Growth	Yield kg/ha	Remark
Sudax (a)	34	Good	Good	4304	Fine stem
Sudax (b)	18	Good	Good	4405	Coarse stem
Cowpeas	17	Good	Good	-	Out grown by weeds
Nunbank buffel	5	-	-	-	Seeding rates too low
Siratro	5	Good	Slow	-	-
Panicum	90	Good	Poor	-	-
Canary seed	90	-	-	-	-
White millet	90	Excellent	Good	-	Heavy weeds
Siratro + Hamel grass	10+5	Good+ Sparse	Slow	-	Heavy weeds
Green panic	45	Good	Good	-	Destroyed by grasshoppers
Grey millet	90	Excellent	-	-	Out grown by weeds
Japanese millet	90	Excellent	Good	-	-
Bullrush millet	179	-	-	-	Poor seed viability
Blue panic	45	Sparse	-	-	Out grown by weeds
Clitoria	13	Fair	Poor	-	Ditto
Elephant grass	1210 plants	Poor	Poor	-	2 rows

Conclusions: Conclusions: Seeding rates of Cowpeas, Siratro, Hamel grass and Nunbank Buffel should be higher for better growth. White millet, Japanese millet and Green panic performed well.

Clitoria grew slowly and competed poorly with weeds. Land preparation should have started earlier so that a number of pre-irrigations and cultivations for weed control could have been carried out before seeding.

TREATMENT: 15 species of fodder crops were planted in small plots which were cultivated with a Ferguson 65 and tiller on December 9 and 13, 1963. Urea was drilled at 7.6 cm at 126 kg/ha before sowing. Seed was hand broadcast on 18/12/63, followed by 126 kg/ha of superphosphate at 2.5 cm depth.

MEASUREMENT: Observation of emergence, growth and development.

FILE NO: 1324 EX

2.6.8. Effect of nitrogen and pasture renovations on yield and hay quality of Sudan grass.

TRIAL NO: 65DB1

PERSONNEL: Fitzgerald K.

LOCATION: Camballin Experimental Area

ABSTRACT:

Aim:
1. To measure fodder yields from a crop of Sudan grass over a number of seasons.
2. To assess the effects on yield and hay quality of application of nitrogen and pasture renovations.

Result: Emergence was poor and seedlings showed their first leaves on 1/5/65. The stands were poor and mowing was late in the season. The trial was abandoned.

Hay samples were analysed:-

Components	%
Ash	9.2
Crude Protein (N x 6.25)	10.0
Crude fat (petroleum ether extract)	1.2
Crude fibre	30.1
Nitrogen free extractive	49.5
Calcium	0.44
Phosphorus	0.15

TREATMENT:

Variety : Commercial Sudan grass

Seeding rate : 50 kg/ha.

Nitrogen and pasture renovation treatments:
1. Basic fertiliser application and treatment.
2. 63 kg/ha urea after each cut.
3. Renovating with tyne cultivator and reseeding at 11 kg/ha after each cut.
4. As in 3 plus 63 kg/ha urea.

All plots received 126 kg/ha urea and 126 kg/ha superphosphate at seeding time.

Irrigation : The land was flooded after seeding and drained rapidly. Further irrigations were applied when required.

MEASUREMENT: Progressive yields, hay quality analysis.

FILE NO: 1909 EX

4.6.9. The performance of Sudax, Siratro, and a Hamel grass Siratro mixture.

TRIAL NO: 63DB1

PERSONNEL: Fitzgerald K., Wickett J.

LOCATION: Camballin Experimental Area, Block E, bays 13, 15, 16

ABSTRACT:

Aim: To assess the performance of Sudax, Siratro and a Hamel grass Siratro mixture at Camballin.

Result: Sudax emerged on July 22, 38 days after sowing. Slow germination was probably due to low temperatures.

Sudax was mown and baled when it reached 50% flowering on September 16. It yielded 1210 kg/ha of coarse hay and 28 days later it grew to 45 cm. Siratro started flowering on July 10. By September 16 the plants were 25 cm tall and 30 cm in diameter and had begun to set seed. The plants were still flowering and setting seed on October 14 while they were drying off. They persisted until December when rain helped recovery.

Hamel grass grew slowly, reaching 15 cm on September 11, 51 days after emergence. It died by October 14 due to drought.

TREATMENT:

Planting date : 14/6/63.

Species & seeding rates :

Bay El3 hand-broadcast with 18 kg/ha Sudax.

Bay E15 " " " " " 3 Hamel grass + 9 kg/ha Siratro.

Bay El6 hand-broadcast with 9 kg/ha Siratro.

Fertilisers : 126 kg/ha of urea and 126 kg/ha of superphosphate were drilled in before sowing.

:

MEASUREMENT: Emergence, growth and development.

FILE NO: 1324 EX

4.6.10. Effect on yield of Sudan grass by cutting at various stages of growth.

TRIAL NO: 62DB1

PERSONNEL: Fitzgerald K., Wickett J.

LOCATION: Camballin, Block G, Bay 5

ABSTRACT: Aim: 1. To determine the effect on yield of Sudan grass by cutting at various stages of growth.

2. To determine the effect of applying nitrogen at each cut.

Result: The trial ran from 4/4/62 to 25/4/63. In December 1962 the plots were often grazed by sheep. In January 1963 grasshoppers damaged the crop, and in February 1963 the area was flooded, so the cutting figures from December 1982 to February 1983 were not useful.

Nitrogen applied after cutting improved yields while more frequent cutting reduced total yields over six months and twelve months.

Sudan Grass Dry Matter Production (kg/ha)

	4 weeks		6 weeks		8 weeks	
Cutting time	-N	+N	-N	+N	-N	+N
6 month total	9313	10067	10231	12314	11309	14967
12 month total	11342	13394	13120	17749	14304	20997

TREATMENT:

Number of replications : 3

Cutting intervals 4, 6 and 8 weeks after planting

Fertiliser rates At each cutting urea was applied compared with a control (Nil):

: 1. 4 week interval: 63 kg/ha

: 2. 6 week interval: 94 kg/ha

: 3. 8 week interval: 126 kg/ha

: All plots received a basal dressing of 125 kg/ha of urea at the time of planting.

Plot size : Single drill width (2.1m), 20m long

Seeding rate : 34 kg/ha

MEASUREMENT: Yields at each cutting.

FILE NO: 1155EX

4.6.11. The wet season performance of sorghum species.

TRIAL NO: 63DB4

PERSONNEL: Fitzgerald K., Wickett J.

LOCATION: Camballin Experimental Area, Block E, Bay 31

ABSTRACT:

Aim: To observe how different species of fodder sorghum perform at Camballin.

Result: Germination of all species was poor due to waterlogging in December. The plots were infested with weeds and only Sorghum almum and Sudax survived, with 7.2 and 2.4 plants/sq.m.

By March the crops were 150 cm tall and 50% flowering. They were then cut and baled. Sorghum almum yielded 3120 kg/ha of thick-stem hay. Sudax yielded 1040 kg/ha of coarse, thick-stem (2.5 cm diameter) hay.

TREATMENT:

Species	:	1. Commercial Sudan grass.
		2. Sweet Sudan grass.
		3. Sorghum almum.
	:	4. Sudax.
Land Preparations	:	The area was cultivated with the Ferguson 65 and tiller on 13/12/63 and landplaned on 16/12/63.
Fertilisers	:	Urea at 126 kg/ha was drilled at 7.5 cm before seeding. 126 kg/ha superphosphate was applied with seed at 2.5 cm depth.
Seeding	:	All species were seeded with a seed drill at 34 kg/ha, 2.5 cm depth.
Plot size	:	2.4 m x 50 m each
Planting date		19/12/63

MEASUREMENT: Observation of growth and development, yields at each cutting.

FILE NO: 1324 EX

4.6.12. Wet season production of four varieties of sorghum.

TRIAL NO: 66DB2

PERSONNEL: Fitzgerald K., Hodson J.

LOCATION: Camballin Experimental Area, Block E

ABSTRACT:

Aim: To compare the production of four varieties of fodder sorghum grown during the wet season at Camballin.

Result: Sudan grass did not emerge. Sudax started flowering on June 25 (9 weeks) but was later damaged by wind. Alpha started flowering on July 1 (10 weeks) when the plants were about 75 cm high. Brolgas destroyed the Alpha crop on July 25. Sacchaline sorghum started flowering on July 6 (11 weeks). The stems resisted damage by wind but were too coarse for hay making.

TREATMENT:

Varieties	:	Sudan grass, Sudax, Sacchaline sorghum and Alpha.
Seeding rate		22 kg/ha, 53 cm row spacing.
Fertilisers	:	126 kg/ha superphosphate was applied with seed at 2.5 cm depth. 252 kg/ha ammonium sulphate was applied at 7.5 cm before seeding and 126 kg/ha ammonium sulphate was applied after each cut.
Irrigation	:	Water was applied by furrows; after seeding, at early flowering and after cutting.

MEASUREMENT: Yields, analysis of protein content.

FILE NO: 1324 EX

4.6.13. Comparison of different fodder sorghums.

TRIAL NO: 66DB4

PERSONNEL: Fitzgerald K., Hodson J.

LOCATION: Camballin Experimental Area

ABSTRACT:

Aim: To grow and compare four species of sorghum as a wet season crop continuing into dry season.

Result: Sudax started flowering on June 25 (9 weeks). Wind damaged the stand. Alpha started flowering on July 1 (10 weeks), reaching 75 cm tall. Brolgas destroyed this crop on July 25. Sacchaline started flowering July 6 (11 weeks). The stems could withstand strong wind but were too coarse for hay making. Sudan grass seed did not germinate at all.

TREATMENT:

Planting date : April 1966.

Varieties :
1. Sudan grass (Sorghum sudanense)
2. Sudax (S. sudanense x S. bicolor)
3. Sacchaline sorghum (S. bicolor)
4. Alpha sorghum (S. bicolor).

Seeding rate : 22 kg/ha, 53 cm row spacing.

Fertilisers : 126 kg/ha superphosphate and 252 kg/ha ammonium sulphate at imes of planting. 126 kg/ha ammonium sulphate after each cut.

Irrigation : Water was applied by furrows after seeding, at early flowering stage and after cutting.

MEASUREMENT: Observations on growth and development, yields from cuttings.

FILE NO: 1324 EX

4.6.14. The performance of mixtures of sorghum and legume species.

TRIAL NO: 67DB2

PERSONNEL: Fitzgerald K., Hodson J.

LOCATION: Camballin Experimental Area, Blocks F4, F5 and F6

ABSTRACT:

Aim: To compare production of mixtures of three fodder sorghum species and three legume species.

Result: The sorghums and Lablab purpureus began emerging eight days after planting. Phasey bean emerged one day later. Neonotonia failed to germinate.

By March 16 Sudax was tallest (240 cm) and Sugardrip the shortest. The legumes grew best with Sugardrip. Phasey bean survived competition better than Lablab purpureus.

On March 27 all plots were cut for hay. Sudan andSudax each yielded 5084 kg/ha and Sugardrip yielded 6779 kg/ha.

By June 9 regrowth of Sudan was dense but varied in height to 150 cm. Sudax varied in height up to 195 cm Sugardrip was a fairly uniform 76 cm. The area was topdressed on June 26 with three rates of urea.

Results of the final harvest were:

Harvest date	Crop	Urea (kg/ha)	Yield (kg/ha)
August 29	Sudan	0	911
		126	2498
		252	5541
August 31	Sudax	0	-
		126	-
		252	7242
September 15	Sugardrip	0	1343
		126	1871
		252	7186

TREATMENT:

Planting date : 9/1/67

Species : Fodder sorghums:-

1. Sudan grass (Sorghum sudanense)
2. Sudax (S. sudanense x S. bicolor)
3. Sugardrip sorghum (S. bicolor)

Legumes: -

1. Phasey bean (Macroptilium lathyroides)
2. Neonotonia wightii (cv. Cooper)
3. Lablab purpureus (cv. Rongai)

Plots: : Nine legume/sorghum combinations and three pure stands of sorghum. Each sorghum occupied a single bay, divided into four strips for the three legumes mixtures and a pure stand. Bay size was 3.7 ha.

Seeding rates : Fodder sorghurns = 17 kg/ha

: Legumes = 5 kg/ha

Fertilisers : 262 kg/ha ammonium sulphate was applied at 7.5 cm depth before seeding. 126 kg/ha superphosphate was applied with seed at 2.5 cm. 63 kg/ha superphosphate and 262 kg/ha ammonium sulphate were applied after each cut.

Land preparation : The area was deep ripped with a chisel plough and cultivated with a tiller and disc harrows. The area was pre-irrigated and cultivated to control weeds.

Irrigation : Plots were flooded and immediately drained after seeding. Later irrigations were applied as required.

FILE NO: Unknown

4.6.15. Response of Sudax to rates of nitrogen and phosphorus.

TRIAL NO: 68DB1

PERSONNEL: Fitzgerald K.

LOCATION: Camballin Experimental Area

ABSTRACT: Aim: To measure the response of Sudax to four levels of nitrogen and two levels of phosphorus.

Result: No results available

TREATMENT:

Variety	:	Sudax
Seeding rate	:	22 kg/ha using seed drill at 18 cm row spacing.
Fertilisers	:	Superphosphate at 0 and 258 kg/ha applied with seed and after first cut. Urea at 0, 213, 426 and 639 kg/ha applied before seeding at 7.5 cm.
Plot size	:	Each nitrogen treatment occupied 8 drill widths (8 x 2.13 m).
	:	Superphosphate was applied to half of the planting rows.
Sampling	:	10 quadrat cuts, 36 cm x 90 cm from each treatment.
Planting date	:	April, 1968.
	:	

MEASUREMENT: Emergence date, flowering date, yields from successive cuts.

FILE NO: Unknown.

4.6.16 Effect of increasing rates of nitrogen on yields of Sudax.

TRIAL NO: 69DB1

PERSONNEL: Payne A.L.

LOCATION: Camballin Experimental Area, Field 1

ABSTRACT:

Aim: To assess the response of Sudax to increasing rates of nitrogen.

Result: Sampling on September 26, 69 days after the first watering gave the following yields:

	Nitrogen rates (kg/urea/ha)				
	0	129	258	387	536
Dry weight of tops (kg/ha)	6164	17092	22248	24097	27280

TREATMENT:

Variety	:	Sudax
Seeding rate	:	25 kg/ha with 18 cm row spacing.
Nitrogen	:	0, 129, 258, 387, 536 kg urea/ha.
Planting date	:	18/7/69.
Irrigation	:	Pasture furrow method.

MEASUREMENT: Observations of growth and development, incidence of pests, vegetative dry-weight.

FILE NO: 2743 EX

4.7 Grain Sorghums

4.7.1. Comparison of two varieties of grain sorghum.

TRIAL NO: 65DB

PERSONNEL: Fitzgerald K., Hodson J.

LOCATION: Camballin Rice Area, Block F and G

ABSTRACT:

Aim: To determine yields of two varieties of grain sorghum planted in bulk areas.

Result: Kalo flowered on March 27, 1961 while Hegari flowered on April 11, 1961. Emergence of Kalo was much poorer than Hegari. The crops were badly damaged by grasshoppers and abandoned.

TREATMENT:

Planting date	:	February 1, 1961.
Varieties	:	Kalo, Hegari.
Seeding rate	:	Kalo 10 kg/ha; Hegari 20 kg/ha.
Plot size	:	Kalo 0.8 ha; Hegari 0.1 ha.
Fertilisers	:	63 kg/ha urea and 126 kg/ha superphosphate at planting time.

MEASUREMENT: Emergence date, flowering date, maturity date, yield.

FILE NO: Unknown

4.7.2. Comparison of seeding rates of Sacchaline sorghum.

TRIAL NO: 61DB6

PERSONNEL: Fitzgerald K., Wickett J.

LOCATION: Camballin Experimental Area

ABSTRACT:

Aim: To determine whether increases in seeding rate of Sacchaline sorghum would increase grain production.

Result: Plants emerged on February 10, 1961. Plants reached an average of 30 cm tall by February 27, 1961. No further results.

TREATMENT:

Planting date	:	February 3, 1961.
Variety	:	Sacchaline.
Seeding rate	:	17 kg/ha, 34 kg/ha, 68 kg/ha.
Fertilisers	:	63 kg/ha urea and 126 kg/ha superphosphate.

MEASUREMENT: Emergence date, flowering date, yield at flowering, maturity date, yield at maturity.

FILE NO: Unknown

4.7.3. Comparison of five varieties of grain sorghum during the wet season.

TRIAL NO: 67DB5

PERSONNEL: Fitzgerald K., Hodson J.

LOCATION: Camballin Experimental Area

ABSTRACT: Aim: To compare five varieties of grain sorghum grown during wet season with repeated cutting.

Result: Texas 608 and Texas 610 commenced emergence on January16, 1967 followed by Alpha, Brolga and Kalo on January 17. Texas 608 established better, being more advanced than the rest. By January 23, 1967 average height of Texas 608 was 135-150 cm. Kalo was the poorest with regard to density and stature, averaging 60-75 cm tall. By February 6, 1967 the order of increasing maturity was Kalo, Texas 610, Alpha, Brolga, Texas 608. Weeds had become a problem in all bays. By March 2, 1967, all five bays were weed dominated, weeds averaging 105 cm tall. Reasonable stands of sorghum persisted under weeds. By March 16 heading had started but the plants were in poor condition due to heavy weed competition and showed signs of nitrogen deficiency. All bays except Texas 608 were mown at the end of March. Regrowth from Brolga and Texas 610 was better than the others because of less weed regrowth. Texas 608 grain reached 12.5% moisture content on April 19, 1967. Average head size was about 7.5 cm. By June 9, 1967 about 75% of Brolga and Texas 610 were flowering with average height about 35 cm. The trial was abandoned because of poor stands.

TREATMENT:

Planting date	:	January 10, 1967.
Varieties	:	Texas 608, Texas 610, Alpha, Brolga, Kalo.
Seeding rate	:	22 kg/ha.
Plot size	:	1 bay per variety.
Fertilisers	:	126 kg/ha superphosphate and 252 kg/ha ammonium sulphate at 7.5 cm depth. After each cutting 126 kg/ha ammonium sulphate and 63 kg/ha superphosphate were applied.
Land preparation	:	Land preparation was completed before the wet season. The area was pre-irrigated and cultivated to eliminate weeds.

MEASUREMENT: Grain yield at each cutting, residue yield, notes on growth and development.

FILE NO: Unknown

4.7.4. Comparison of grain sorghum varieties grown during the dry season under different irrigation systems.

TRIAL NO: 67DB6

PERSONNEL: Fitzgerald K.

LOCATION: Camballin Experimental Area

ABSTRACT:

Aim: To compare the performance of different varieties of grain sorghum during the dry season under flood irrigation and furrow irrigation.

Result: The ridge and furrow irrigation system resulted in better plant stands and grain yields than the flood irrigation system. The improvement was attributed to non-crusting of soil surface after initial watering. The crop was harvested on October 5, 1967. The following table shows grain yields taken from a header harvester. The figures for Alpha, Brolga and Kalo were from different header settings.

Grain Yield (kg/ha)

	Flood Irrigated	Ridge & Furrow
Alpha	31	102
Brolga	107	488
Kalo	244	508
Texas 608	544	595
Texas 610	661	1154
Texas 621	559	366
Texas 626	763	930

Conclusion: Yields were low with the hybrids generally yielding better than other varieties. Ridge and furrow irrigation was superior to flooding. Autumn planting resulted in less weed infestation, however only one crop was possible.

TREATMENT:

Planting date : May 25, 1967.

Varieties : Sorghum almurn, Zulu, Alpha, Brolga, Kalo, Pioneer 846, Texas 608, Texas 610, Texas 621, Texas 626.

Seeding rate : 22 kg/ha.

Irrigation	:	One bay was allocated for ridge and furrow irrigation. Four rows were planted to each variety. Two bays were employed for flood irrigation where each variety occupied five drill widths at 18 cm row spacings.
Fertiliser	:	126 kg/ha superphophate and 200 kg/ha urea.

MEASUREMENT: Grain yield, air dry crop residue yield.

FILE NO's: 1909 EX and 1379 EX

4.7.5. Dry season production of grain sorghum.

TRIAL NO: 68DB4

PERSONNEL: Fitzgerald K.

LOCATION: Camballin Experimental Area

ABSTRACT:

Aim: To test the production of sorghum during the dry season under irrigation.

Result: Not available.

TREATMENT:

Planting date	:	April 1968.
Variety	:	Texas 610.
Seeding rate	:	22 kg/ha.
Fertiliser	:	425 kg/ha urea was applied at 7.5 cm depth before sowing.
	:	126 kg/ha superphosphate was applied with seed.
Irrigation	:	First irrigation was applied after seeding. Subsequent irrigation was applied when needed.

MEASUREMENT: Grain yield at each cutting. General notes on growth and development.

FILE NO: Unknown

4.7.6. Phosphorus requirement of grain sorghum under pasture furrow irrigation.

TRIAL NO: 69DB3

PERSONNEL: Fitzgerald K., Power K.F.

LOCATION: Camballin Experimental Area

ABSTRACT:

Aim: To compare yields of grain sorghum produced with and without superphosphate on the Camballin soil under pasture furrow irrigation.

Result: Emergence was poor resulting in low population. Yield figures showed no consistent response to superphosphate although observations indicated some response in plant height and maturity date. Grasshoppers attacked the crop in early September, followed by birds. About 35% of the crop was damaged.

TREATMENT:

Planting date	:	July 18, 1969.
Variety	:	Texas 610.
Seeding rate	:	28 kg/ha.
Fertiliser	:	450 kg/ha urea was applied over both treatments. One received no superphosphate and the other 252 kg/ha superphosphate.

FILE NO: 2744 EX

4.7.7. Effects of different methods of planting and seedbed preparation on emergence of grain sorghum.

TRIAL NO: 69DB4

PERSONNEL: Power K.F.

LOCATION: Camballin Experimental Area

ABSTRACT:

Aim: To compare grain sorghum emergence under ridge and furrow seedbed and pasture furrow seedbed.

Result: No significant difference in emergence was observed between treatments 1 and 2 (fertiliser drilled and banded respectively). Emergence on the pasture furrow seedbed started later and progressed slower than on the ridge and furrow seedbed. The latter system gave an even plant density and higher yield potential. Final grain yield figures were not possible due to regular attacks by birds, especially magpie geese and little corellas. Finches also fed on the grain at the milky-dough stage.

TREATMENT:

Planting date : Early September 1969.

Variety : Texas 610.

Seeding rate : 28 kg/ha for the ridge and furrow seedbed, 56 kg/ha for the pasture furrow seedbed. (Accidentally doubling the planned rate.)

Fertiliser : 45 kg/ha urea.

Planting treatment :

1. Ridging and sowing by cotton planter at 82.5 cm ridge spacing, fertiliser by tyne drill (2 rows per ridge)
2. Ridging and sowing as in 1. but fertiliser was banded at 13 cm.
3. Fertilising and sowing by drill on pasture furrow bed with 82.5 cm furrow spacing.

FILE NO: Unknown

4.7.8. Comparison of grain sorghum varieties grown during the wet season.

TRIAL NO: 70DB3

PERSONNEL: Payne A.L., Power K.F.

LOCATION: Camballin Experimental Area

ABSTRACT:

Aim: To compare promising varieties of grain sorghum grown at Camballin during the wet season.

Result: The plants suffered from bird damage, especially from magpie geese, little corellas, star finches and crows, during the period from early April to harvest. Grasshoppers attacked the crop near the end of March but were kept in check by Carbaryl at 2.2 kg/ha. The crops were harvested on May 5, 1970. Only varieties NK275, E57 and F64 were continued as second crops by top dressing with 510 kg/ha urea. They were mown and irrigated after the first harvest.

Varieties	Germination (%)	Mid flowering date	Average height (cm)	Head weight (g)	First cut yield (kg/ha)	Second cut yield (kg/ha)
E57	92	2/4/70	114	371	2998	5130
F64	96	2/4/70	147	365	2952	4110
T67I	80	24/3/70	122	476	3845	-
T6I0	52	19/3/70	127	556	2998	-
NK31O	82	12/4/70	-	-	-	-
NK275	90	22/3/70	114	564	4555	5943

TREATMENT:

Planting date	:	January 23, 1970.
Varieties	:	Texas 610, Texas 671, NK275, NK31O, F64, E57.
Seeding rate	:	11 kg/ha, two rows per ridge, dry sowing.
Fertilisers	:	247 kg/ha superphosphate at 9 cm depth using tyne drill.
		525 kg/ha Urea banded at 14 cm depth.
Irrigation	:	The day after sowing to start germination.

FILE NO: Unknown

4.8 Other Crops

4.8.1. The development and yield of oats on Cambailin black soil.

TRIAL NO: 60DB4

PERSONNEL: Fitzgerald K., Wickett J.

LOCATION: Camballin Experimental Area

ABSTRACT:

Aim: To assess the development and yield of oats on Camballin black soil.

Result: Emergence started on July 26, 6 days after sowing. Plant counts on August 1 gave 106 plants per square metre. Flowering started on September 14 and finished on September 22. Irrigation was applied ten times at weekly intervals. The crop was harvested on October 27 and yielded 9294 kg/ha of dry matter (air-dried). Grain yield was 2144 kg/ha.

TREATMENT: Oat seed was drilled at 2.5 cm at 34 kg/ha on 20/7/60, 63 kg/ha of urea and 126 kg/ha superphosphate were applied with seed. Plots were flooded after sowing and quickly drained.

MEASUREMENT: Emergence date, plant count, flowering date, maturity, yield.

FILE NO: 1315 EX

4.8.2. Effect on oat yields of irrigating before seeding at two rates.

TRIAL NO: 60DB5

PERSONNEL: Fitzgerald K., Wickett J.

LOCATION: Camballin Experimental Area

ABSTRACT:

Aim: To assess the effect of irrigating before seeding on oat yields.

Result: Emergence was poor. The 34 kg/ha seeding rate gave three plants/sq.m while 68 kg/ha gave 14 plants/sq.m. The trial was abandoned because of poor stands.

TREATMENT:

Planting date	:	24/8/60
Seeding rate	:	34 kg/ha, 68 kg/ha.
Fertiliser	:	63 kg/ha urea and 126 kg/ha superphosphate at seeding.
Irrigation	:	Before sowing on August 15. Subsequent irrigation on August 29, September 8.
Plot size	:	One drill width (2.13 m), 200 m long per treatment. All treatments were in one bay.

MEASUREMENT: Emergence dates, plant counts, flowering dates, maturity dates, yields at flowering and at maturity.

FILE NO: 1315 EX

4.8.3. Comparison of grain yields of two varieties of oats.

TRIAL NO: 63db5

PERSONNEL: Fitzgerald K.

LOCATION: Camballin Experimental Area

ABSTRACT: Aim: To compare grain yields of two varieties of oats at Camballin.

Result: Emergence and growth was poor due to a low seeding rate (50 kg/ha), water shortages and low temperatures. Wallaby damage was very severe.

Bays H4 and H5 were reseeded at 100 kg/ha on 4/8/63 with 126 kg/ha urea at 7.5 cm and 126 kg/ha superphosphate at 2.5 cm. The higher seeding rate gave excellent stands:-

Bay No.	Variety	Rate (kg/ha)	Sown	Emergence	Flowering (50%)	Harvest	Height (cm)	Yield (kg/ha)
9	Ballidu	50	June 7	June 27	Sept. 30	Nov.18	80	156
8	"	50	"	"	"	"	"	70
7	Dale	50	"	July 3	Oct. 7	"	"	72
6	Dale	50	"				"	failed
5	Ballidu	100	Aug. 4	Aug. 12	Oct. 14	Nov. 30	65	30
4	Dale	100	"	"	Oct. 21	"	"	23

TREATMENT:

Planting date : Mid April 1963.

Varieties : Dale (mid season) and Ballidu (early)

Seeding rate : 50 kg/ha

Fertiliser : 126 kg/ha urea was placed as deep as possible before seeding.

: 126 kg/ha superphosphate was drilled in with seed at 2.5 cm.

Irrigation : Water was applied by flooding.

MEASUREMENT: Flowering dates, maturity dates, grain yields, observation on growth and development.

FILE NO: 1355 EX

4.8.4. Effect of time and rate of seeding on yields of wheat.

TRIAL NO: 64DB3

PERSONNEL: Fitzgerald K.

LOCATION: Camballin Experimental Area

ABSTRACT: Aim: To compare yields of wheat sown at Camballin on April 24 and July 23, at 50 and 100 kg/ha.

Result: No results available.

TREATMENT:

Planting date	:	24/4/64 and 23/7/64.
Variety	:	Gamenya.
Seeding rate	:	50 and 100 kg/ha.
Fertilisers	:	252 kg/ha arnmonium sulphate applied at 7.5 cm before planting and 126 kg/ha superphosphate applied with seed.
Irrigation	:	Plots were flood irrigated and rapidly drained at regular intervals.

MEASUREMENT: Flowering dates, maturity dates, yields.

FILE NO: 1819 EX

4.8.5. Comparison of oat grain and hay yields from two planting dates.

TRIAL NO: 64DB1

PERSONNEL: Fitzgerald K.

LOCATION: Camballin Experimental Area, Block H, bays 7-9, block G4

ABSTRACT:

Aim: To compare grain and hay yields of oats sown on April 23 or July 22.

Result: The stand was poor because of damage by wallabies and competition from Sorghum almum which had persisted from the previous season. In mid August the trial was abandoned.

TREATMENT:

Planting date	:	23/4/64 and 22/7/64.
Variety	:	Ballidu.
Seeding rate	:	For grain 50 and 100 kg/ha; For hay 67 and 134 kg/ha.
Fertiliser	:	126 kg/ha urea at 7.5 cm before seeding, 126 kg/ha superphosphate applied with seed.
Cultural practice	:	Seed bed was well prepared and free of weeds. Plots were flood irrigated at regular intervals.

MEASUREMENT: Flowering dates, maturity dates, cutting dates, grain and hay yields, analysis of fodder cut.

FILE NO: 1355 EX

4.8.6. Comparison of the development and yields of varieties of oats and wheat grown under irrigation.

TRIAL NO: 65DB2

PERSONNEL: Fitzgerald K.

LOCATION: Camballin Experimental Area

ABSTRACT:

Aim: To compare the performance of three varieties of oats and four varieties of wheat grown under irrigation at Camballin.

Result: Wallabies grazed the wheat and there was a lack of irrigation water later in the season. The trial was abandoned.

TREATMENT:

Planting date	:	30/4/65.
Varieties	:	Oats Fullmark, Kent, Ml26; Wheat Kondut, Wagin, Mengavi, Gamenya.
Seeding rate	:	112 kg/ha.
Fertiliser		126 kg/ha urea at 7.5 cm before seeding, 126 kg/ha superphosphate and copper drilled with seed at 2.5 cm.
Irrigation		Water was irrigated by furrows and alternately flooded at regular intervals.

MEASUREMENT: Flowering dates, maturity dates, cutting dates, grain and hay yield, analysis of fodder cut.

FILE NO: 1355 EX

4.8.7 Grain and hay production of oats.

TRIAL NO: 65DB3

PERSONNEL: Fitzgerald K., Hodson J.

LOCATION: Camballin Experimental Area, Block H

ABSTRACT:

Aim: To determine the grain and hay production of oats at Camballin and to examine the effect on yields of copper in superphosphate.

Result: Last watering was on 13/8/65 while ears were emerging. Hay stands appeared similar and head formation had initiated by 27/7/65. All heads had emerged by 18/8/65. The hay crops were cut on 28/6/85 and average hay yield was 4.6 t/ha. The grain crops hayed off by 15/9/65. Superphosphate gave a 1000 grain weight of 23.1 g while adding copper gave 19.6 g.

Conclusion: The grain crop failed because of insufficient water for irrigation. Two more waterings appeared necessary for a successful grain crop.

TREATMENT:

Planting date	:	Last week in April 1965.
Oat variety	:	Avon.
Seeding rate	:	100 kg/ha for grain crop and 134 kg/ha for hay crop.
Fertilisers	:	126 kg/ha urea at 7.5 cm before seeding and 126 kg/ha superphosphate and superphosphate and copper drilled with seed.
Irrigation	:	Water was applied by furrows on May 4, May 21, June 4, June 18, July 1, July 12, July 27, August 13.

MEASUREMENT: Flowering dates, maturity dates, cutting dates, grain and hay yields, analysis of fodder cut.

FILE NO: 1355 EX

4.8.8. Effect of separate and combined applications of nitrogen and phosphorus on the development and yield of oats.

TRIAL NO: 61DB4

PERSONNEL: Fitzgerald K., Wickett J.

LOCATION: Camballin Experimental Area, Block E, bays 22, 23, 24

ABSTRACT:

Aim: To measure the effects of single and combined applications of nitrogen and phosphorus on the development and yield of oats.

Result: Plants emerged on August 16, 20 days after sowing. The area was grazed by straying sheep from Liveringa Station. By August 28, average height of the plants was 7.5 cm and the stand was poor. The trial was abandoned.

TREATMENT:

Planting date	:	27/7/61 after pre-irrigation on 6/7/61.
Nitrogen levels	:	NO = No nitrogen; Nl = 63 kg/ha urea at seeding.
Phosphorus levels		P0 = No phosphorus; P1 = 63 kg/ha superphosphate at seedling; P2 = 126 kg/ha.
Treatment combinations		N1PO, NOP1, N1P2, NOP2.
Plot size	:	One drill width (2.13 m) per treatment.

MEASUREMENT: Emergence dates, germination counts, flowering dates, hay yield at flowering, maturity date, hay yield at maturity, grain yield at maturity.

FILE NO: 1355 EX

4.8.9. Effect of urea and ammonium sulphate, applied at two depths, on oat yields.

TRIAL NO: 64DB2

PERSONNEL: Fitzgerald K.

LOCATION: Camballin Experimental Area, Block H1

ABSTRACT: Aim: To compare the effect on oat yields of urea and ainmonium sulphate applied at two depths.

Result: No results available.

TREATMENT:

Planting date	:	24/4/64.
Variety	:	Ballidu.
Seeding rate	:	67 kg/ha with seed drill at 2.5 cm.
Fertiliser	:	Superphosphate was applied with seed at 126 kg/ha. Nitrogen was applied at 126 kg/ha urea and 252 kg/ha ammonium sulphate, at 2.5 cm and 7.5 cm before seeding.
Irrigation	:	Plots were flood irrigated.

MEASUREMENT: Emergence dates, maturity dates, yields, tendency to lodge.

FILE NO: 1818 EX and 1355 EX

4.8.10. Performance of three oat varieties grown under irrigation.

TRIAL NO: 66DB1

PERSONNEL: Fitzgerald K., Hodson J.

LOCATION: Camballin Experimental Area, Block E

ABSTRACT:

Aim: To determine yields of three oat varieties grown under irrigation.

Result: Flowered in late July. Irrigation problems, weed competition, wallabies and brolgas reduced grain yields to 50 kg/ha.

TREATMENT:

Planting date	:	End of April, 1966.
Varieties	:	Avon, Ballidu, and Kent.
Seeding rate	:	100 kg/ha.
Fertilises	:	252 kg/ha sulphate of ammonia and 126 kg/ha superphosphate.

MEASUREMENT: Flowering dates, yields

FILE NO: 1355 EX

4.8.11. Comparison of the development and yields of varieties of wheat, oats and barley grown under irrigation.

TRIAL NO: 67DB1

PERSONNEL: Fitzgerald K., Hodson J.

LOCATION: Camballin Experimental Area

ABSTRACT: Aim: To compare the development and yields of varieties of wheat, oats and barley.

Result: Ballidu and Irwin oats started flowering two months after seeding, but Avon and Kent did not flower until August 14. Avon showed the same result in two previous trials. Avon yielded best but it's long vegetative growth period demands an assured supply of water. Irwin gave a satisfactory yield.

Gamenya flowered early and yielded best compared with the other wheat varieties. Yields of all barley varieties were too low for commercial production.

	Variety	First Flowering	Yields kg per row
Oats	Avon	August 14	4.0
Wheat	Gamenya	July 31	3.3
Oats	Irwin	July 31	3.0
"	Ballidu	August 7	2.9
Wheat	Glenwarri	August 14	2.8
"	Summit	August 6	2.4
Oats	Kent	August 14	2.4
Wheat	Festiquay	August 21	2.3
"	Gabo	July 31	2.1
Barley	Prior	August 3	2.0
"	Beecher	August 4	1.8
Wheat	TR 135	August3	1.8

TREATMENT:

Planting date	:	19/5/67
Varieties	:	Wheat - Gamenya, Gabo, Glenwarri, Summit, Festiquay, TR135; Oats - Avon, Ballidu, Irwin, Kent; Barley - Beecher, Prior.
Seeding rate	:	100 kg/ha, sown by hand, not covered.
Fertilisers	:	126 kg/ha superphosphate. Urea, 126 kg/ha.
Plots	:	One row per variety, 30 cm row spacing.
Irrigation		First flood irrigation on 30/5/67.
Harvest date		September 21 - October 13.

MEASUREMENT: Flowering dates, maturity dates, yields.

FILE NO: 27167 EX

Appendix

TABLE 1: Monthly rainfall (mm) at Camballin, 1958 to 1975 (Bureau of Meteorology).

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	TOTAL
1958							-	-	-	-	19	72	-
1959	57	60	14	7	41	0	0	0	0	0	10	27	216
1960	303	162	7	44	7	0	0	0	0	9	0	8	540
1961	18	216	44	11	0	0	0	0	2	3	48	70	412
1962	318	217	1	0	1	10	10	0	2	3	4	152	718
1963	215	145	42	0	39	0	0	0	16	0	19	65	541
1964	225	42	33	35	17	0	0	0	0	0	38	8	398
1965	86	44	60	0	0	5	1	0	0	8	21	12	236
1966	101	308	72	9	8	21	0	0	0	0	-	37	-
1967	249	280	46	0	1	0	0	0	0	1	10	56	641
1968	78	193	192	9	64	3	9	0	7	1	20	38	614
1969	111	201	149	0	11	-	0	0	0	-	21	6	-
1970	29	69	26	23	75	0	0	0	0	-	19	154	395
1971	-	-	214	-	-	5	0	0	0	0	50	186	-
1972	27	93	130	0	0	0	0	0	0	17	3	43	313
1973	118	112	100	126	7	18	0	4	1	13	52	93	644
1974	330	97	110	85	44	0	3	10	42	-	14	55	-
1975	107	-	37	4	0	9	0	0	14	110	15	-	-
Mean	148.3	149.3	75.1	22.1	19.7	4.4	1.4	0.8	4.9	11.8	21.4	63.7	522.9

Appendix

TABLE 2: Numbers of rainy days per month at Camballin, 1958 to 1975 (Bureau of Meteorology).

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	TOTAL
1958	-	-	-	-	-	-	-				4		-
1959	9	6	4	4	4	0	0	0	U	0	5	5	37
1960	12	9	3	3	2	0	0	0	0	1	0	4	34
1961	4	13	5	2	0	0	0	0	1	2	3	5	35
1962	23	12	1	0	1	3	1	0	1	1	3	6	52
1963	20	18	5	0	5	0	0	0	2	0	2	8	59
1964	13	2	6	5	3	0	0	0	0	0	9	5	43
1965	8	7	12	0	0	3	1	0	0	3	5	5	44
1966	10	11	7	2	3	4	0	0	0	0	-	4	-
1967	18	17	5	0	1	0	0	0	0	1	5	5	52
1968	11	14	11	2	9	2	4	0	2	2	4	6	67
1969	6	11	4	0	2	1	0	0	0	-	3	2	-
1970	5	10	2	4	5	0	0	0	0	1	3	8	38
1971	-	-	13	-	-	1	0	0	0	0	3	11	-
1972	6	10	7	0	0	0	0	0	0	2	1	5	31
1973	10	5	8	4	2	2	0	1	1	2	4	8	47
1974	22	10	9	8	3	8	1	1	1	-	2	5	-
1975	6	-	1	1	0	1	0	0	2	6	6	-	-
Mean	9.8	10.3	5.9	2.2	2.4	1.5	0.4	0.1	0.5	1.3	3.7	5.9	43.5

Appendix

TABLE 3: Daily pan evaporation (mm) at Camballin, 1965, 1966 and 1973-1977 (Bureau of Meteorology)

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
1965	10.7	-	-	8.2	6.5	5.7	5.5	6.6	9.3	11.1	11.4	-
1966	9.3	6.5	7.2	6.3	5.5	3.8	5.6	6.6	8.3	10.2	-	11.5
1973	-	-	-	-	-	5.8	6.7	7.1	10.7	12.5	12.0	10.5
1974	5.6	6.9	7.3	5.5	4.2	5.2	5.3	6.3	7.2	-	9.9	11.3
1975	12.2	-	8.6	9.3	8.5	6.5	6.5	8.4	10.0	9.6	11.2	-
1976	-	-	6.7	6.7	-	7.1	-	-	-	-	-	-
1977	-	-	-	-	-	4.7	-	-	-	-	-	-
Mean	9.5	6.7	7.5	7.2	6.2	5.5	5.9	7.0	9.1	10.9	11.1	11.1

Appendix

TABLE 4: Mean daily maximum temperatures (degree celsius) at Camballin (Bureau of Meteorology).

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
1965	40.2	40.2	35.8	37.1	35.2	31.0	29.9	33.7	37.1	39.3	40.8	41.6
1966	38.2	35.8	37.1	36.8	31.7	30.9	30.8	31.2	36.8	38.4	-	40.3
1967	37.9	33.0	35.3	36.8	34.3	27.7	28.3	33.0	36.1	41.0	41.4	40.8
1968	38.9	34.7	35.7	35.7	29.7	31.6	27.5	31.7	36.5	39.4	41.4	41.4
1969	39.0	34.4	35.5	36.1	34.0	29.3	30.1	32.8	35.3	-	42.0	42.3
1970	42.3	40.3	40.6	36.6	32.2	32.9	30.9	-	37.1	41.6	40.8	-
1971						29.4	31.0	34.5	38.2	41.5	39.7	38.3
1972	39.9	39.1	37.1	37.6	33.0	31.2	31.2	33.8	36.6	40.0	-	41.4
1973	36.1	38.2	38.0	37.3	34.1	31.3	33.1	33.7	36.3	39.7	39.6	38.3
1974	32.4	35.5	35.8	32.9	30.8	28.9	31.1	33.3	34.5	-	41.0	-
1975	38.6	-	32.9	-	-	-	-	32.8	36.7	36.3	40.3	-
1976	-	33.5	-	32.3	-	-	-	-	-	-	-	-
1977	-	-	-	-	-	30.1	-	-	-	-	-	-
Ave	38.3	36.5	36.4	35.9	32.8	30.4	30.6	33.1	36.5	39.7	40.8	40.5

Appendix

TABLE 5: Mean daily minimum temperatures (degree celsius) at Camballin (Bureau of Meteorology)

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
1965	25.5	25.1	24.2	16.8	16.8	14.5	9.5	14.5	18.9	22.3	24.6	26.4
1966	25.1	24.6	23.3	21.4	15.8	15.6	14.1	13.5	18.0	21.7	-	24.8
1967	24.9	23.6	22.6	19.0	17.0	8.5	8.3	12.9	16.1	21.3	24.7	25.6
1968	25.4	23.7	24.1	22.3	17.9	15.0	12.4	14.9	19.6	22.0	24.4	24.5
1969	25.3	24.1	23.1	16.8	15.8	11.3	13.0	10.5	15.7	-	24.1	24.8
1970	25.6	25.3	23.4	21.5	19.9	13.2	10.2	-	17.3	23.4	23.3	-
1971	-	-	-	-	-	12.6	10.8	15.2	19.1	23.0	24.1	23.9
1972	24.7	24.1	22.8	20.3	16.2	13.8	12.0	16.0	20.2	22.7	-	25.4
1973	25.2	25.0	25.5	22.4	19.7	16.9	17.6	19.4	19.1	22.7	24.4	25.7
1974	24.2	24.5	23.6	21.5	17.6	13.2	12.5	16.4	20.0	-	16.6	16.9
1975	22.8	-	24.8	22.5	17.2	14.0	17.0	16.3	21.0	21.3	24.9	-
1976	-	23.5	22.8	18.4	-	11.0	-	-	-	-	-	-
1977	-	-	-	-	-	12.2	-	-	-	-		
Average	24.9	24.3	23.7	20.3	17.4	13.2	12.5	15.0	18.6	22.3	23.5	24.2

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