AN AGRICULTURAL HIGH SCHOOL FOR CERES

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C O N T E N T S.

R E S E A R C H - C.A. MORKEL - 1963.

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INTRODUCTION:

It is essential for this country that a progressive policy shall be adopted in the field of agriculture for it can be said that the agricultural industry of the Republic plays a leading part in the development of its potential resources and is of great importance to the country's wellbeing. It is the backbone of the country's economic structure, being equalled to in importance only by our mining industry.

In a country with a thriving and growing farming community there is an ever increasing demand for experienced farm managers, owners, soil conservation officers and men who have had an agricultural training. It follows, therefore, that proper and adequate training of our youth in this sphere is of no mean importance.

The degree of mechanisation and scientific methods of farming, which has been achieved over the past decade, has necessitated specialised training and also broadened the field of study considerably.

Owing to these facts it has become desirable for students to commence training at an early age.

Until fairly recent years the agricultural college was the student's first real introduction to the study of his subject. To-day with the introduction of Government sponsored agricultural high schools, where boys commence training at the age of 12, after having transgressed from primary school, marked improvement has been noted in college results. It is now an accepted fact that agricultural high school training has proved its worth, is no longer experimental, but here to stay.

One of these schools has recently been erected in the Western Province, ten miles outside Paarl, and about 25 miles from Cape Town, to serve the immediate Boland. It is one of the first to be established here, so near to Cape Town, and seems to have aroused a good deal of public interest (myself included), probably because of the interesting nature of such an institution, or its novelty. This is probably the reason for my choice of subject.

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FUNCTION AND AIMS OF AN AGRICULTURAL HIGH SCHOOL.

It is the chief aim of such a school to provide the necessary vocational training for young prospective farmers. A training which will enable them to become successful farmers, who will enhance the standard of agriculture of the Republic.

It is not the intention of the school to train scholars in any particular branch of agriculture, but rather to give them a good and thorough training in both the theoretical and practical sides of agriculture.

Each school serves its own allotted district and the type of farming employed is representative to the district. The school strives to give students instruction in as many useful trades as possible and courses are so arranged that theory and practical go hand in hand.

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AGRICULTURAL EDUCATION : GENERALLY.

Agricultural education may be obtained through a variety of branches or forms. Briefly it may be divided into two main groups:-

1. That obtained at a school, and
2. that which is obtained at a college or university.

1. SCHOOL AGRICULTURAL EDUCATION:

(a) This type of education may occur in primary and secondary schools, or even in Training Colleges, where it takes the form of one of the subjects of the syllabus. Here only theory is taught and practical demonstrations neglected. This system has proved unsatisfactory in the past and is rapidly disappearing in the Republic.

(b) Agriculturally-biassed education:

This type of education is in fact the long sought for answer to the shortcomings of the above system and forms the subject for my thesis. The Agricultural High School or Farm School, as it is also known, provides an ordinay education given in an agricultural atmosphere and environment, which keeps the pupils in constant contact with agricultural conditions. In their spare time the pupils follow farm methods, and are

permitted to perform odd jobs on the farm. In this way they gain a good grounding in agriculture, as well as an ordinary education. These schools are rapidly becoming instated in the Republic and are working well and have shown good results.

2. VOCATIONAL AGRICULTURAL EDUCATION:

This is provided by a college or university for educating farmers, farm managers and foremen, peasants and labourers. It may be divided into three types:-

(a) Elementary - for the education of the lower classes, i.e. peasants and labourers. This is done by giving on the spot lectures and demonstrations.

(b) Secondary - for the education of prospective farm foremen and managers. Here, the accent is on the practical side of farming. The usual procedure adopted at agricultural colleges in the Republic is for the student to spend three consecutive days on practical work and the remainder of the week at lectures, demonstrations and laboratory work.

(c) Higher and Technical - for preparing farmers for large scale work. Students usually devote one-third of their time to agricultural practice and the performance of other farm work. A higher standard of lectures on science, farm economics, agriculture and

also more advanced laboratory work are given, so that by the time the student leaves, he should know the "why" of every farm practice.

Education of this type is provided by many universities where B.Sc. degrees in agriculture may be obtained.

3. SCIENTIFIC AGRICULTURAL EDUCATION.

An education of this type is provided by the Universities and really takes the form of a post-graduate course, with the accent on science. Students are given only a day per week for agricultural practice, the rest of the time being spent on agricultural research. In this way they maintain a scientist's attitude, even though they do not become scientists in the true sense of the word. Such an education is obtained at all recognised universities in the Republic.

REMARK:

One cannot fail to appreciate the great advantage that must be enjoyed by the college or university student who has already acquired the basic knowledge of his subject in an Agricultural High School.

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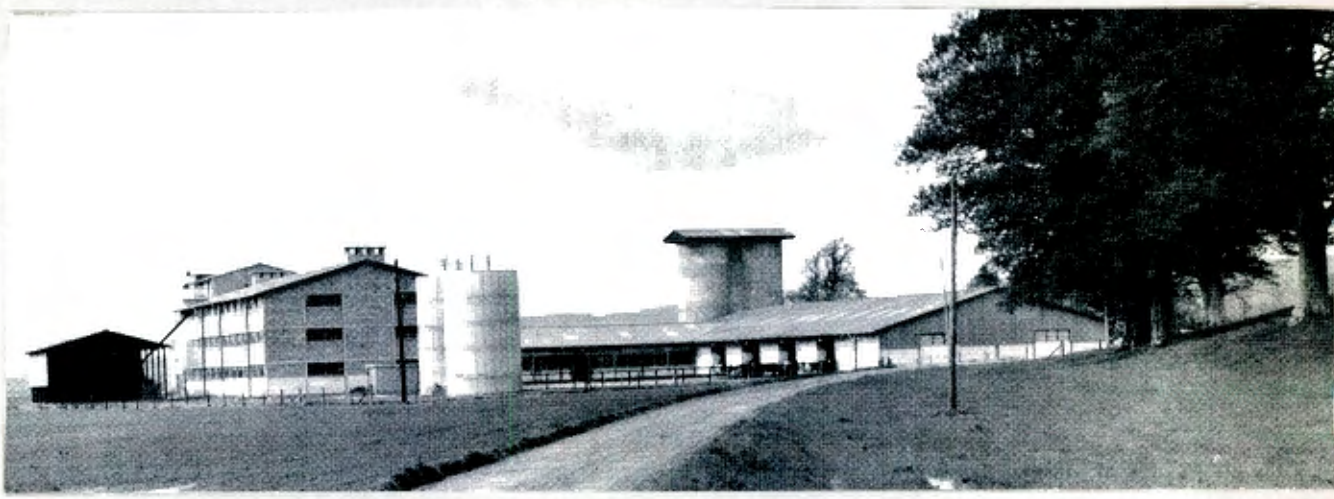

A Farm near Limerick, Eire

OAKDALE AGRICULTURAL HIGH SCHOOL.

(Established in 1931).

HISTORY:

Oakdale is one of the older Government sponsored farm schools in the South Western Districts. It is situated on a farm approximately 2,000 morgen in extent and two miles from Riversdale. It used to be a privately owned farm before being purchased by the Government for the purpose of converting into an agricultural training school.

The first school established in 1931 was merely an apprenticeship school for pupils from standard seven to ten. A hostel was built to house about eighty boys, and the farm house converted into a school building. The existing farm buildings were retained and added to. In 1955 the school was promoted to "Agricultural High School status", and in 1957, standard six was incorporated. An additional hostel was erected to house a further 120 boys. New farm buildings were also erected and the old buildings demolished or improved.

In 1958 Mathematics was introduced into the syllabus as an alternative for agricultural economics. A modified science course was also taught, which gave

pupils the necessary entrance qualifications to universities.

Oakdale serves the South Western District, and include such centres as Caledon, George, Mossel Bay, Swellendam and Oudtshoorn. It also served the Western Province before the new farm school at Paarl came into being.

FACILITIES: to date are as follows:-

There are two hostels housing approximately 200 boys.

A study hall of moderate size which is also used for general purposes and a "U"-shaped school building with an office block adjoining.

Sporting facilities consist of:-

An athletic course,

Swimming Bath,

Tennis Court,

A Cricket Pitch, and

Two Rugby Fields.

Farm Buildings consist of:-

1. Sheep Shearing Shed.
2. Apple Store and two General Stores.
3. Workshop.
4. Vegetable Store.
5. Dairy.

Farm Buildings (Continued):

6. Farm Machinery Garage and Implement Store.
7. Horse Stable and Cow Shed.
8. Calf Pens.
9. Fowl Runs and Incubator House.
10. Pigsties.
11. Silos.

Farm Personnel Accommodation consists of:

A Principal's House.

4 Houses for Married Instructors.

A Farm Manager's House.

2 Foremen's Houses

10 Labourers' Cottages..

All these units are spread over a large terrain and are connected to each other by a network of tarred roads. The hostels are situated near the Main Road and completely divorced from the practical area of the farm, i.e. the livestock section, workshop, etc., are correctly placed as regards prevailing winds (foul air).

The farmstead comprises of a moderate sized farm dairy with up-to-date milking sheds, equipped with electrical milking machines, cow houses, pig sties and implement sheds, etc.

The buildings have been somewhat haphazardly

placed, this being due to the fact that the scheme had not been initially planned as a whole, but gradually, to meet new requirements, as its ribbonlike development would indicate. Because of this, there is no particular relationship between the functions of the farm buildings and the functions of the field. It also appears that relationship of certain buildings one to the other have been ignored.

All the farm buildings have been cheaply and simply constructed in 9" brickwork, with lime washed walls and corrugated iron roofs - the farm houses, hostels and school having been given slightly more expensive finishes.

The farm has at least 500 morgen under cultivation and there are extensive paddocks for livestock, mixed farming being widely practised with the assistance of mechanisation in most cases. There is a plentiful supply of water and much soil suitable for the production of all foodstuffs particular to the district.

Livestock:

40 Cows

2 Bulls

800 Sheep

30 Pigs

10 Horses

1,000 Fowls.

Fruit Trees:

400 Peach

1200 Apple

and an insignificant number of various other trees.

Grain Cultivation:

Wheat

Oats

Mealies

Barley.

Vegetables are grown to supply the Hostel and also lucern as winter fodder for the animals.

Curriculum:

The school curriculum consists of English, Afrikaans and Agriculture; the latter being a double subject. The above subjects are compulsory for all pupils attending the school, but the students have a choice of the remaining two subjects. The remaining subjects are Mathematics, Agricultural Economy, Agricultural Science and a normal Science subject.

The teaching staff comprises six specially qualified instructors, married men housed on the farm, three teachers living in the "dorp" and a principal. The school has a male secretary, who also acts as house-father. The Hostel boasts a Library, Reading

Rooms and a Recreation Hall.

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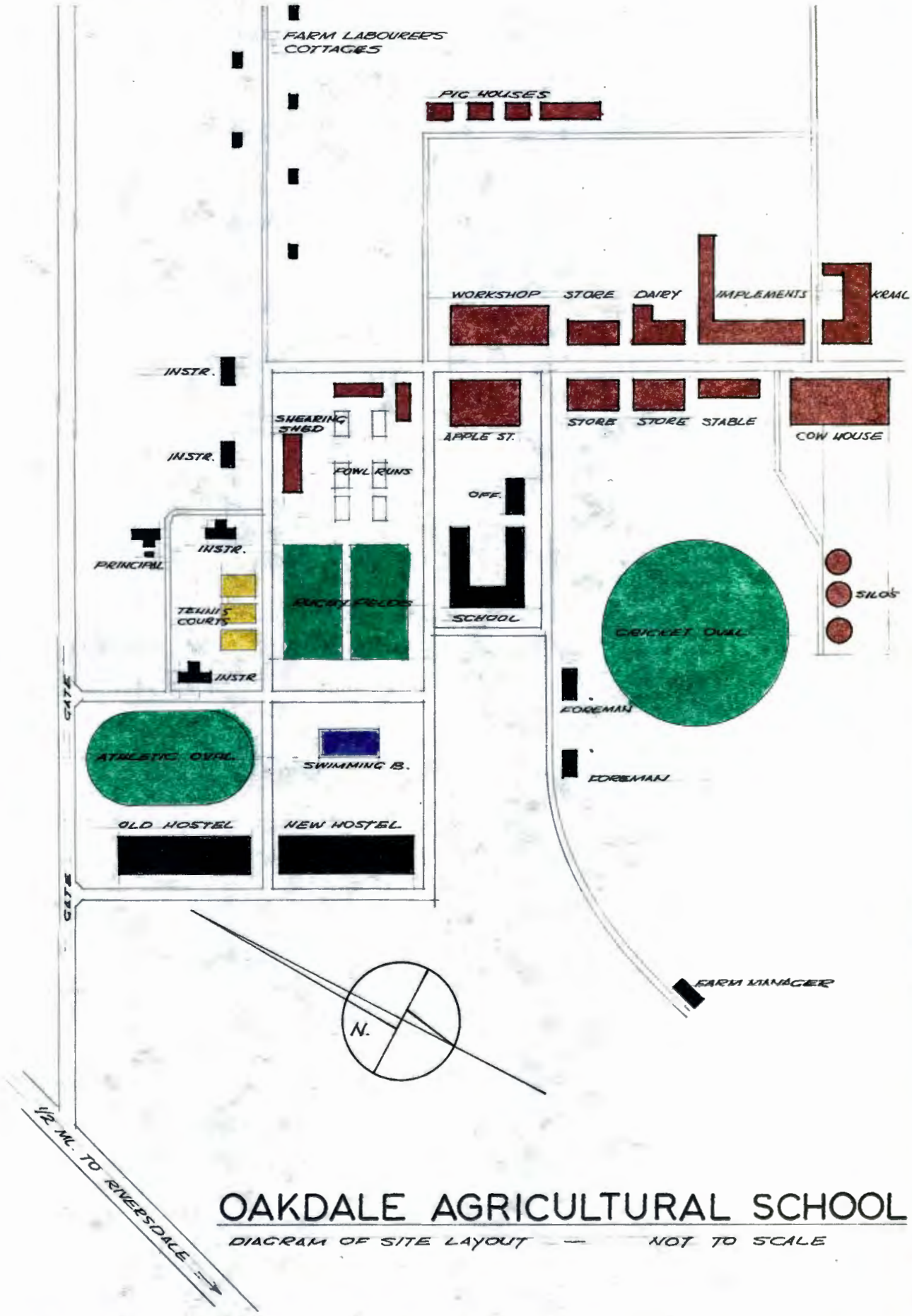


OAKDALE AGRICULTURAL SCHOOL

DIAGRAM OF SITE LAYOUT — NOT TO SCALE

PAARL : AGRICULTURAL HIGH SCHOOL BOLAND.

(Completed 1961)

Langerug, is situated 10 miles from Paarl in the "Agter" Paarl area, is the newest farm school in the country and was completed in November last year. It falls within the winter rainfall area and serves the Boland farming community. The farm Langerug was bought by the Government in 1958 and a firm of architects was assigned the job of designing the school, farm buildings and a hostel to accommodate 190 boys. The architects were given a free hand and as none of the old buildings were to be re-used, except the old farmstead, the architect could plan the layout without being hampered by existing structures and roads, as was the case at Oakdale.

Site:

The farm Langerug was chosen because it met with most of the requirements of a farm school. It was thought to be conveniently situated, distant enough from Paarl to discourage boys from wandering into Town at odd times and yet not too far when travelling by bus. It is not the intention to divorce the pupils completely from the social and cultural centre, especially during week-ends, when the boys are permitted to attend concerts, bioscopes and church

services.

The nearest railhead is at Simondium, which is about nine miles from the school and makes delivery and dispatch of goods a practical proposition. The farm has a good supply of subterranean water, which is procured by means of boreholes and storage dams. The water is of good quality and suitable for domestic purposes. The nature of the land too was suitable for the purpose of a farm school. The fields undulate gently and a large, almost flat tract of land, suitable for building on simplified the planning and lay-out. The quality of the soil was considered to be a true representation of soil to be found in the district which the school serves. (This seems to be an important factor in the choosing of a site, for it is desirable that the farm lands should possess the bad as well as the good qualities of soil.

Building on sloping ground is considered highly undesirable, as it makes handling of farm machinery and general manoeuvrability difficult, as well as dangerous for pupils and farm hands. Cost of erection of buildings are also affected and as it is the intention of the school to set an example to the boys, correct choice of site and planning is considered part of their training.

The farm is served by a tarred highway, which does not cut through the farm, but forms its Southern boundary. This is a definite advantage as the bisecting of fields by traffic-ways are inclined to hamper farming activities, as well as being a danger to the lives of humans and animals.

It is also a great advantage if cheap electric power is available, but not absolutely essential. Langerug is fortunate in this respect as they are supplied directly by Escom.

The Buildings:

Hostel:

The Hostel houses 190 boys, 4 instructors, a matron and five assistant-matrons. Provision has also been made for the housing of six domestic servants.

The Hostel, a double storeyed building, has the following accommodation:-

Ground Floor:

50 Bedroom Units (2 boys per unit).
2 Bedrooms with adjoining bath for two male instructors.
Toilet accommodation for boys.
A Matron's Flat.
Bedroom and Bathroom for Assistant-matrons.
Office.
Small Sitting room near Entrance Hall.
Diningroom to seat 200 persons.
Kitchen Store and Laundry.
Servant's Quarters.

First Floor:

45 Bedroom Units.
2 Bedrooms with adjoining bathroom for 2 Instructors.
Toilet accommodation for Boys.
4 Bedrooms served by 2 Bathrooms for Assistant-matrons.
Recreation Hall - size 20' x 60'.

SCHOOL:

7 Classrooms.
Staff Room.
2 Science Laboratories.
Toilet Block.
Assembly Hall.
Principal's Office.
Janitor's Store.

Principal's House, which is the original farm homestead, which has been renovated.

Superintendent's House, which adjoins Hostel.

Teaching Staff Houses: Four in number.

Foreman's Houses: Two in number.

Farm Manager's House.

Workshop: Comprising of Woodwork Shop,
Machine Shop,
Metalwork Shop,
Store and Office.

"Waenhuis": For the housing of tractors, trailers and Lorries.

Implement Shed: For Threshers, Binders, etc.

Open Shed: For Ploughs and oil storage.

Stable: For 10 horses - with Harness and Fodder Store.

Bull and Calf Pens: Consisting of:

2 Bull Pens, each 10' x 15',
3 Hospital Pens, each 10' x 15'.

Bull and Calf Pens - (Continued):

A section allotted to calves up to 6 months old;
A Nursery, and
Toilet accommodation for Non-Europeans.

Cow House and Dairy:

The Cow House accommodates 40 cows, with adjoining Fodder Store, Weighing Room and Dressing Room, Cold Room and Butter Preparation Room, and Toilets.

Slaughter House: With adjoining Skin Store.

Wool Shearing Shed: With shelter under floor space.

Silos: Two in number, 30' high and 11' in diameter.

Barnhouse:

Cattle Kraal:

Labourers' Cottages: 10 in number.

Material:

The material used in the erection of these buildings has been chosen with an eye to economy.

The Hostel, School and Personnel Houses are constructed of 12" hollow brick walls, plastered internally and bagged down and limewashed externally. The roofing material is asbestos cement tiles and the floors mainly of asphalt tiles.

The Farm Buildings were constructed of 9", 12" and 14" brick walls bagged down internally and externally, except where smooth plaster was necessary, internally.

Roofing material used was corrugated iron and the floor mainly cement reinforced where necessary. Standard steel windows were used throughout.

The buildings have been well spread out over the site and quite pleasantly arranged. The Hostel has been placed a considerable distance away from the farm building with the school building lying between.

The Personnel Houses have been strung out to the East of the Hostel, but the Principal's House enjoys a central position. The farm buildings have been so positioned as to form an "L" shape and two low walls starting at each arm of the "L" meet at a right angle forming a rectangular enclosure or inner court. The functions of the various farm buildings and their relativity one to the other, has obviously been taken into account, and the buildings have been accordingly grouped, with the result that there should be no circulation problem.

My only criticism of the lay-out though is, that the idea of spreading the buildings out has been rather overdone, viz. the distance between the Hostel and Farm buildings is quite a considerable walking distance and would prove a nuisance to pupils and staff during the Cape winter months.

FARM ACTIVITIES:

The farm is of a fair size, approximately 3,000 morgen, comprised of mostly grain fields. The planting of fruit trees will be commenced with in the near future, as well as the cultivation of vines. The farm has a good proportion of rich soil, ideal for vegetable growing.

LIVESTOCK:

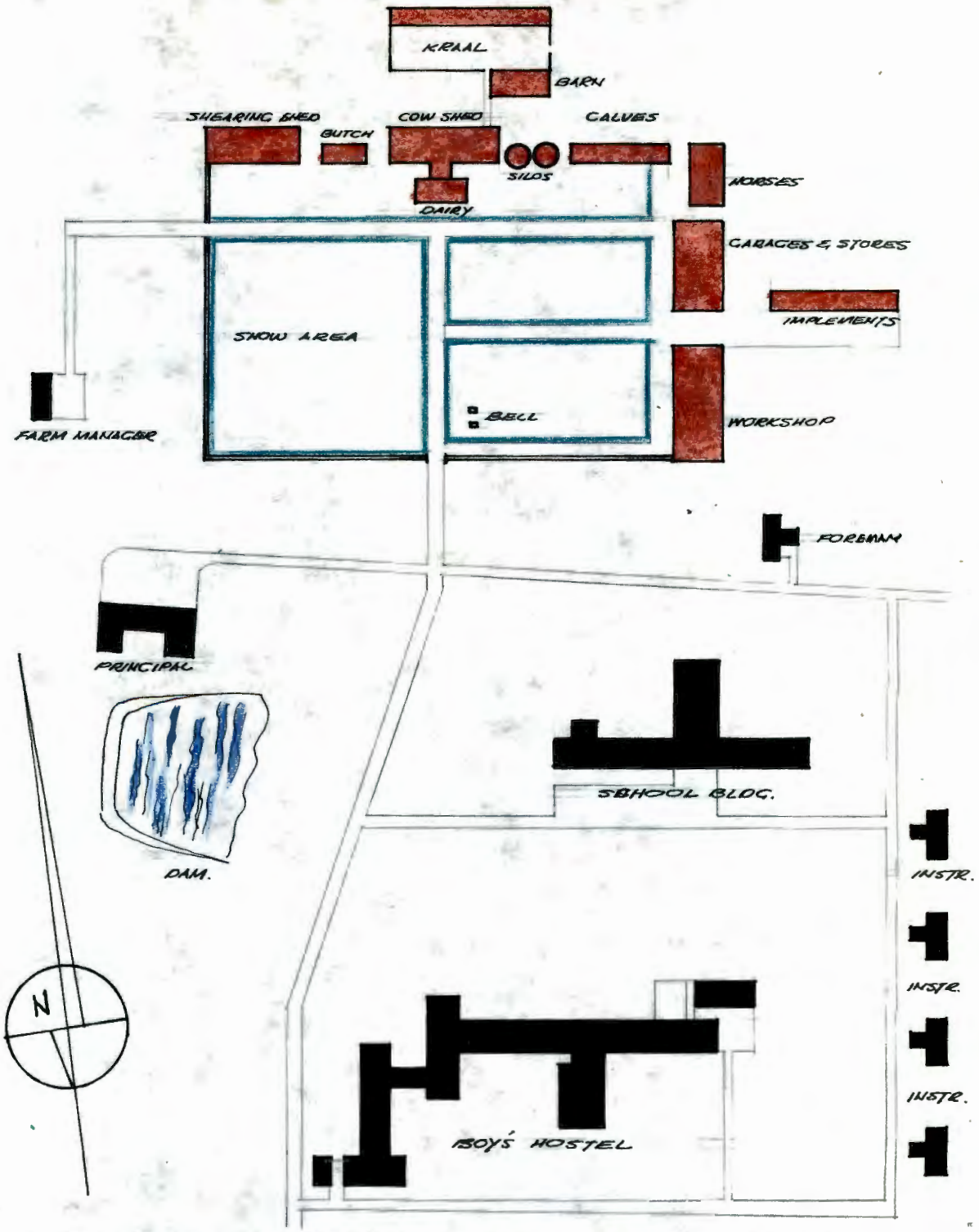
The livestock at present comprises:-

800 Sheep	40 Cows (Jersey)	2 Bulls.
10 Horses	30 Pigs	1000 Fowls.

Although not entirely self-supporting, the farm can supply the hostel with all the milk, butter, and eggs needed and also with most vegetables. The meat supply, however, is not sufficient and meat has to be purchased outside. All surplus products of the farm are marketed and the proceeds go towards running expenses of the institution.

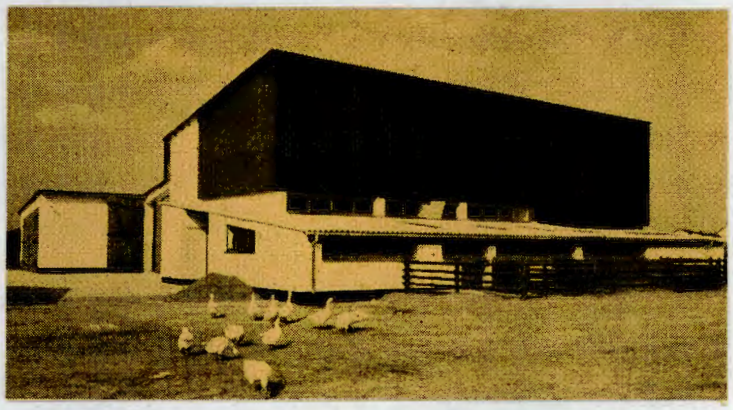
CURRICULUM:

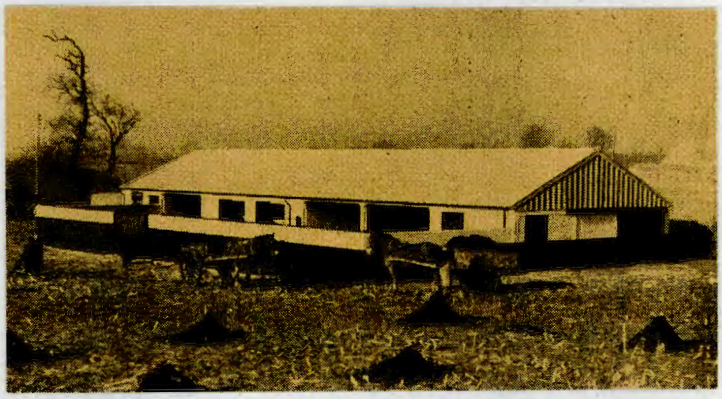
The curriculum at Langerug is without exception the same as for Oakdale and also take in pupils from Standard VI upwards. The teaching personnel comprises four specially qualified instructors, housed on the farm, three teachers living in Paarl and a Principal.

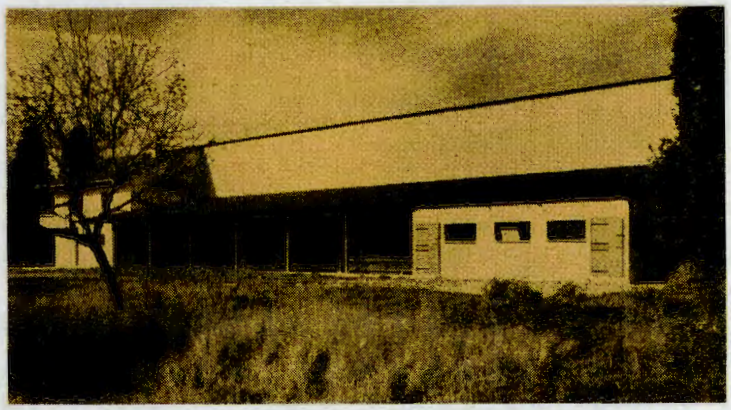


BOLAND AGRICULTURAL HIGH SCHOOL

DIAGRAM OF SITE LAYOUT (NOT TO SCALE) LANEERUG







Modern Trends

ELSENBURG AGRICULTURAL COLLEGE.

Although the research concerns Agricultural Schools, and not Colleges, this example is nevertheless useful as a study.

Elsenburg is the oldest college of Agriculture in the Republic, having been established officially as a separate college in 1898. Originally the college was situated at Stellenbosch and attached to the University there, until the farm "Elsenburg" was bought by the Government, for the specific purpose of establishing an agricultural college. It is situated 30 miles from Cape Town, and 8 miles from Stellenbosch, and serves the whole of the Western Province. The farm is of moderate size, 1,250 morgen, with approximately 1,600 acres laid out under pastures, crops and foodstuffs. The rest of the acreage has been allotted to the cultivation of fruit trees, vines, forestry and tobacco. Seventy-five morgen has been reserved for experimental work on rotation of crops and mixed farming systems.

Additions to the usual syllabus provided at an agricultural college are the external lectures and time spent on viticulture and pomology, which

studies, especially apply to the Western Province. At least 4,000 vines are handled per annum, and give the students valuable experience.

Also included is the theory and practice of bee-keeping, and a short course in the cultivation of Turkish tobacco, a small percentage of which is grown in the neighbourhood.

Accent is placed on the breeding of live-stock, especially cattle, and Elsenburg experiments have done much to improve the standard of dairy cattle throughout the Republic.

Elsenburg provides accommodation for 40 students per annum, in one hostel with all the necessary attachments, such as, dining rooms, kitchen, matron's quarters, with the accommodation for married and single staff. Two large lecture rooms, library and staff rooms are also provided.

As the college is also attached to the Stellenbosch University, it is possible to take a degree course in Agriculture, as well as the usual Diploma Course.

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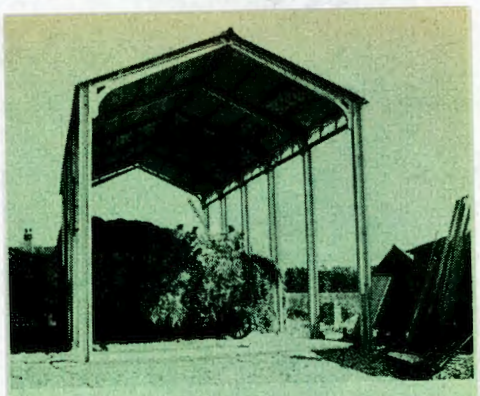


The supporting structure of these "Dutch" barns consists of reinforced concrete frames spanning anywhere from 20-40 ft. and up to 23 ft. high which are prefabricated by a number of British firms and delivered to the site ready for use. The erection can be accomplished rapidly. Corrugated asbestos-cement sheets are especially suitable for the roof covering. It is recommended that roof gutters and down spouts (both, as well of asbestos cement) be provided, even for barns without walls. In the event that one or more walls are desired for enclosure, these, too, can be of corrugated asbestos-cement sheeting, fastened to horizontal members of either concrete or steel tubes. Such a Dutch barn, of reinforced concrete and corrugated asbestos, is unaffected by any type weather condition and requires no protective coatings whatsoever.

THE FARM BUILDINGS.

For centuries the buildings of our farms have been governed by requirements of a traditional and slow-moving industry. Of recent years, however, for numerous reasons our farmers have come to appreciate the advantages of modern development and techniques in agriculture. With the coming of the new efficiency their buildings require an equally radical approach.

Functions of Farm Buildings:

The basic function of a farm building may be for one of four things:-

1. Rearing raw material for food production, e.g. Calf Houses and Pig Farrowing Houses.

2. Converting course foods into foods fit for human consumption, e.g. Dairy Cattle Sheds. (For milk, butter, cheese)and pig fattening houses (for bacon pork) deep litter hen houses (for eggs).

3. Processing foods to improve their quality or change their physical state, e.g. dairies (for extracting and cooling of milk), milling and mixing (for preparation of animal foods).

4. Storing food and equipment, e.g. feeding stuffs: Straw, grain, fruit,

4. (Continued):-

Fertilisers and implements.

The Economical Aspect:

Every farm building forms part of an investment. Any part of a building which does not contribute to a profit being made from the enterprise concerned, hinders the success of the farm. Moreover, any capital saved from the potential cost of a building can be used to buy better stock, seed or machinery for the enterprise.

Choice of Material and Method of Construction:

In the erection of any framed building on a farm, the choice of material for the frame is important, and it will have to be related to the most appropriate method of construction. It will be found that quite often a farmer has a strong preference in the choice of material, a preference which may be based on prejudice. Therefore the designer may have to discuss the merits of each material in order to make the best choice.

Timber barns have an unfortunate historical background for the modern farmer. With their heavy timber construction and traditional weather-boarding

they have left a legacy of heavy maintenance costs. Though the large barns may be useful when in good repair, the king-post trusses in the smaller buildings are a hindrance in their conversion for modern farming practice. The ravages of dry-rot and beetle infestation have led also to the unpopularity of timber. Pressure-treated timber has provided a material which does not require maintenance and modern techniques of construction have reduced the scantlings required. Therefore timber construction has grown in popularity in the last few years, but it has not led to a widespread revival. In many instances, timber barns can prove cheaper than steel or concrete, but it is not always possible to maintain the clear and unobstructed headroom provided by portal construction in the other materials. Timber is a material which is easily adapted for minor modifications in layout, and which allows the easy fixing of services.

Farmers also may have a prejudice against the use of steel. The triangular truss was popular after the war because of its light weight and cheapness. It was used frequently for the many cowhouses that were erected, as well as in stockyards and storage barns. But the trusses reduce the available headroom

in the building, and this has proved a hindrance in the use of modern machinery and in the conversion of the buildings for changes in methods. The many angles which form the truss have also proved troublesome in maintenance. These features may lead to prejudice against the use of steel, but are not of great consequence when considering steel portal frames. The portal frame will give clear headroom within the roof space and the pitch of the roof can be made to suit specific requirements. The webs of the stanchions are useful for forming a key to solid walls or for forming a slot to house the ends of railway sleepers used as a cheap form of movable walling. Repainting the simple steel sections is not difficult, compared with the traditional truss, and with good painting at the time of erection maintenance need not be an expensive problem.

In contrast to timber and steel, reinforced concrete barns have gained popularity since the war, and have been developed by many firms. The structure needs no maintenance after erection, but is liable to fracture if knocked by machinery. It is less economic to vary the standard proprietary units to suit any particular requirement than with the other materials.

STEEL BARNS

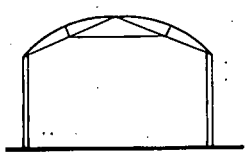
Steel, like timber, can be used to form a truss, but the normal truss is not satisfactory for many farm buildings. Other structural techniques are available in steel but only the portal frame has general appeal due to its simple design. The traditional Dutch barn is useful for some purposes, and the lattice beam construction can be used as an alternative to a timber lattice.

Dutch barns

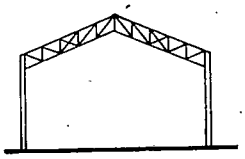
(Fig 8) This traditional building is the cheapest form of steel barn. The use of galvanised roof sheets formed to the curve of the roof will be cheaper than the alternative asbestos-cement covering. The latter will cost about £15 more per 15ft bay for spans between 20ft and 30ft. Normally, the standard spans are in increments of 3ft for galvanised-iron covering, and of 6ft for asbestos-cement for spans from 15ft up to 30ft. Barns with asbestos-cement covering will cost between 6s and 6s 6d per sq ft. The main disadvantages are in the loss of clear-height, maintenance problems, and the junction of the barn with a lean-to or other buildings. However, it provides effective cover as a single barn to act as a straw or hay store.

Lattice beams

(Fig 9) Lattice beams can be used in conjunction with stanchions. Spans of up to 40ft are the most common, but the principle can be adapted for wider spans. Up to 40ft, the depth of the lattice will be about 2ft to 2ft 6in. Wider spans would need a deeper lattice, which might not be desirable since the lattice restricts headroom. For the smaller spans, the cost is likely to be a little cheaper than a comparative portal frame.



8 DUTCH BARN



9 LATTICE BEAM

Portal frames

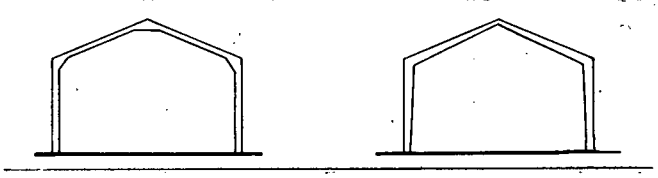
(Fig 10) Welded portal frames are not normally used, since bolted portals have proved adequate. Frames can be made up to 120ft. The traditional roof pitch of 22deg can be reduced to about 17deg for about the same price. Reducing the pitch to 12deg, which is desirable for appearance and sometimes in order to give the heights required, will increase the cost by 6d to 9d per sq ft. The steel portal is unlikely to prove economic in competition with other frames for spans of under 40ft. At 40ft the cost tends to be a little more than 6s 6d per sq ft, rising to about 8s 6d or 9s for 100ft to 120ft spans. The use of timber purlins rather than of steel angles usually proves economical. The purlins should be pressure treated. A 15ft bay requires 7in × 2½in purlins at 4ft 6in centres. The purlins are bolted to steel angles, bolted onto the top flange of the portal frames. Some portal frames are available which are made up from intermittent web plates welded to a top and bottom steel tube.

CONCRETE FRAMES

Concrete frames are manufactured with a number of different variations based on the portal technique. They include portals jointed at apex and ground, and, at the other extreme, a combination of columns and beams bolted together. Purlins normally are in concrete but a few firms use timber which is more economical.

Three-joint portal

(Fig 11) The frames are bolted at the apex, and held by concrete foundation blocks at the base. The disadvantage is in the size of precast unit which has to be transported by road and tends to limit its use to the smaller barn spans.



10 PORTAL 11 3-JOINT PORTAL

Five-joint portal

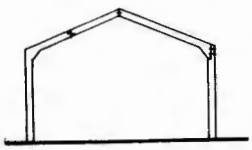
(Fig 12) This is the most common type of framing technique for spans of up to 70ft. The position of the joint in the arm is important. That shown on the left of the diagram is the better structural method, but that on the right is adequate provided the seating of the arm on the upright is good and tends to be cheaper, but is not used normally for spans above 40ft. The frames are held by concrete foundation blocks.

Upright and beam portal

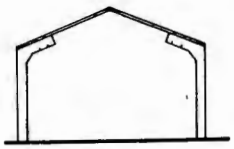
(Fig 13) This method of construction can be about 6d per sq ft cheaper than the other portal types, since the entire thrust of the roof is held by the bolts which connect the arm on to the upright. Spans are limited to about 40ft maximum. At least one firm uses timber for the arm, which offers a further economy. Visually, the junction of upright and beam is less satisfactory since the line of thrust is broken.

Butterfly roof

(Fig 14) Concrete frames can be used on the ' butterfly ' principle to give a height at the two sides rather than at the centre as in the traditional barn. This could be useful for storage, particularly of implements. The illustration shows a frame on this principle erected at the Royal Show, Cambridge. In the background is a low pitch concrete frame at 11¼deg.



12. 5-JOINT PORTAL



13. UPRIGHT BEAM & PORTAL

14. BUTTERFLY ROOF

When considering proprietary frames, it is likely that the choice of material will have less bearing on the overall cost than the choice of the structural technique of the frame. This is a general statement, since some techniques are relevant only to particular materials, and, in some instances, one material may be cheaper than the others. To make the correct choice for a frame to suit a farm, it is necessary to appreciate the different types of framing techniques which are available with each material.

Ventilation of Animal Houses:

Wall inlets are less important than has in the past been believed and it is possible to arrange for sufficient fresh air to enter from gable ends to ventilate a series of parallel buildings 100 feet long with no outside walls. These gable inlets must be capable of being regulated though it should be arranged that they are not tight shut in winter.

In cow-houses, at least one sq. ft. of inlet-opening should be allowed for every four cows. Satisfactory additional inlets can be provided if desired by louvred dormers on the lower slopes of the roofs.

A continuously open ridge is recommended for cow-houses, with about 75 square inches of permanent opening per cow and adjustable additional openings for hot summer days. Fresh air is fairly evenly distributed throughout such a building and the amount of rain that comes through the ridge is not significant.

Once gable and ridge ventilation has been proved to be really satisfactory, it becomes possible to add lean-to sheds alongside any such farm building, provided it also has roof lights. The "factory" type roof, which gives good light and is economical to construct, can be similarly ventilated so lang as the covered space is not greater than 100 feet in either direction.

Wall inlets have been proved to be more satisfactory when they are placed high up, so that the incoming cold air is well exposed to the warmer atmosphere before it descends.

Particular care should be taken to avoid cold draughts near the floor. Good ventilation is more important than a large air space for each animal and 550 cubic feet per cow is now considered adequate in place of 800 cubic feet formerly advocated.

It is more important to ventilate buildings well than to preserve heat. Cows and horses in the Ceres district need protection from wind and rain rather than from the cold. Even pigs which are more economically fattened in a warm building suffer more from the intense heat in summer and the damp foetid atmosphere of a badly ventilated building, than from a cool, but well-ventilated building - provided always there is no cold draught near the floor.

In cases where hay is stored over the cowshed, it is recommended that ventilation ducts should be installed in the ceiling.

Daylight:

Window skylights and also electric light fittings need to be placed so that each part of the building has a good bright light, without glare, and that sharp shadows are not cast. The intensity of daylight required cannot be given in accurate figures as it can for artificial lighting, because daylight varies with the time of day, the season and the weather.

The Building Research Station has, however, worked out the following table which gives the approximate amount of daylight required at various positions in farm buildings:-

Building	Position	Height above floor Level.	Min. Daylight Factor.
Cowhouse:	Udder of Cow	3'.0"	3.5 %.
	Manger	1" 0"	2.5%.
	Feeding Passage	Floor Level.	1.0%.
Piggery:	Feeding Passage	Floor Level.	2.5%.
	Sleeping Quarters	"	1.0%.
	Dunging Passage.	"	3.5%.
Food Room:	Machinery	3'0".	3.5%.
	Mixing Flour	Floor Level.	3.5%.
Workshops:	Bench.	3'0".	5.0%.
General : Min.	Anywhere.	Floor Level.	1.0%.

NOTE: The daylight factor is the amount of daylight required at each point as a proportion of the light given by the whole sky out of doors, i.e. a daylight factor of one per cent corresponds to an illumination 1/100th of that of the whole sky.

Windows in Walls:

These have dark pockets just below them where cleaning is most important and where good light will show up rat holes. Windows in walls also draw a glare in the eyes of both animals and workers.

Even with a continuous strip of wall windows 3 feet high on both sides of a 33 feet wide building the daylight factor is not high enough at the udder of the cow. Indeed at any point beyond 20 feet from the window wall the daylight factor drops below 3.5 per cent even with windows 5 feet high and continuous.

If all windows are placed high up they give better illumination. For instance, a building with lean-to sheds on both sides can be reasonably well lit by strips of glazing above the roof heights of the sheds.

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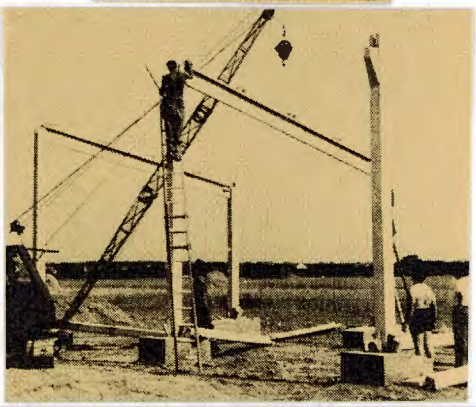


Prefabricated Barns in Western Germany

GROUPING OF FARM BUILDINGS.

Among the points to consider when judging the lay-out of farm buildings are their suitability to local conditions, their relation to both internal and external farm transport and the type of construction employed in relation to cheapness, simplicity and adaptability.

The diagram, although not based on an actual plan, might form the basis of a workable scheme. It brings out clearly the possibilities of a definite separation of "clean" and "dirty" farm traffic. Animal manure and farm implements moving to and from the fields are on the "dirty" side of the farm; car, dairy vans, transport and delivery of food and dry stores are on the "clean" side. The diagram also brings out the division of the farm into three distinct departments:

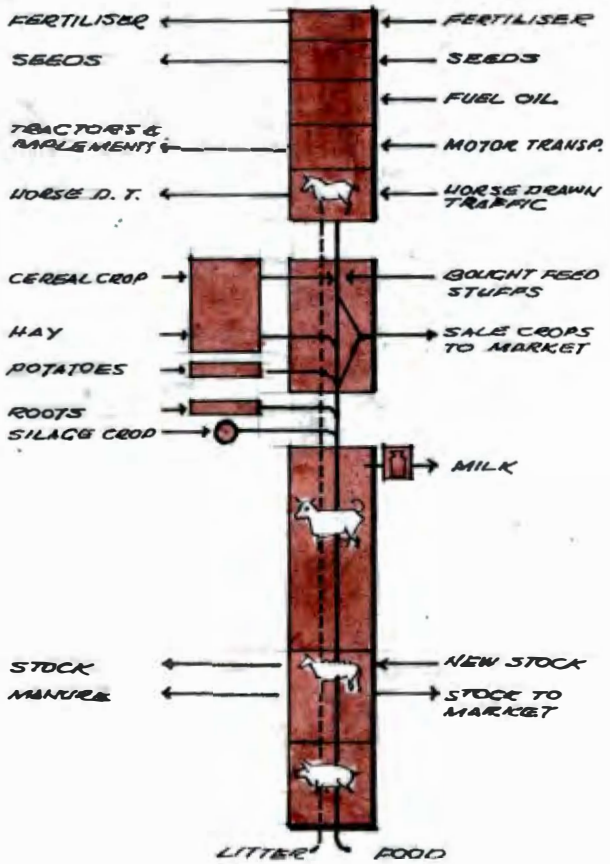
(a) Dry Stores, Machinery, Transport Vehicles (+ horses).

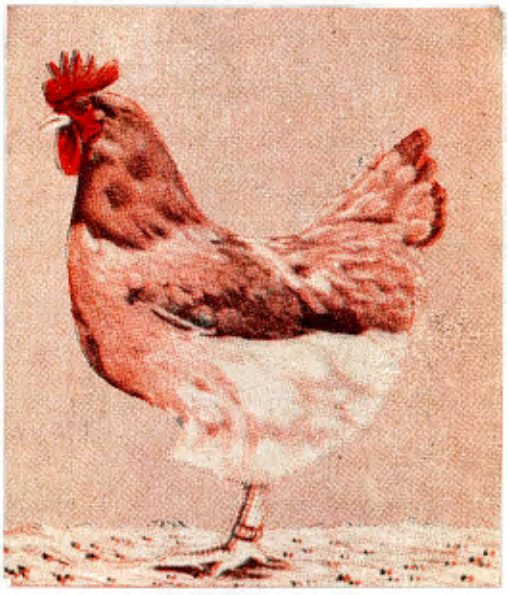
(b) Crop storage and food preparation.

(c) Animals.

All three points are closely interlinked but there are fewer direct connections with the machinery section than between food room and the animal houses.

MOVEMENTS IN AND OUT OF THE FARM





GOLDEN R.N. 77.

CATTLE YARDS AND DAIRY YARDS erected for dairy herds will require a loafing area which should be fully covered or partly covered to form a bedded area with an open exercise space. Provision will also have to be made for storage of winter bulk feeding stuffs which may be distributed to the herd by machine or hand.

In addition straw may have to be stored and dairy herds will have to have access to milking parlour and dairy, either from the cow house or loafing yard, depending on the system used.

It is important that the method of cattle management be determined before even attempting to design the lay-out or establishing sizes of buildings required. There are several different management policies adopted mainly because of different climatic conditions. In some parts of the country the climate and grass lands allow the cattle to be kept permanently in the fields. A movable parlour on wheels known as a bail is taken into the fields for milking, and thus no building is required under this method.

In the method known as zero grazing, the cattle are permanently housed in yards and the grass is cut twice a day by machine, taken to the yards and placed in the mangers for feeding.

This method increases the value of the grass and so doing may cover the extra labour and running cost.

In some parts of the country, not only would cattle lose condition if kept in the fields during the winter, but the grass would be damaged seriously by poaching, i.e. the churning of ground by the hooves of the herd. Milk yields would be depressed as a result of these factors. Therefore herds are brought into buildings for the winter period. The cattle farmer in the Ceres district would have to employ the latter method of herding because of the severe cold in winter.

Dairying:

The method of milking cows to-day, where there is a fair sized herd (30 + milking cows) is by means of machine. This system employs less labour and less water, maintains the cow in better health and produces better quality manure.

If hand milking or bucket plant mechanical milking are employed, the milking house must have no direct communication with the yard in which the cows live. With a combine recorder plant, however, the milk runs into stainless steel tubes to the cooling room without ever being exposed to the air.

There is thus no risk of infection and no restriction on the location of the milking house.

The milk receiving room should contain wash basins, hot water supply and cupboard for brooms, pails and clean overalls. It may also contain the electrical equipment and milking machine.

If the milk cooling room is separate, it should only contain the cooler and sufficient space to move the churns, The sterilizing room receives all empty churns, all used milking apparatus and pails.

A draining board or rack should be provided, possibly with a steam connection for sterilizing milk lines and teat cups. The sterilizing room must contain space for all the clean churns to be stored.

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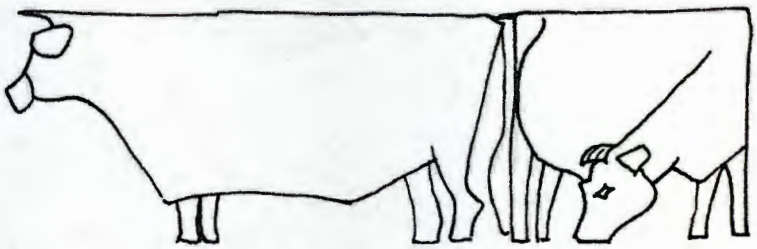

JERSEY HEIFERS.

PIGGERY.

There are two main kinds of pig housing - for farrowing, in which piglets are born and weaned, and for fattening, in which young pigs grow to maturity and are fattened for bacon or pork.

A basic management decision is involved in whether the enterprise is to be intensive; which means the pigs are kept indoors, or extensive; when they are kept out of doors. A semi-intensive system is also used, and normally in this method the piglets go out to grass at about three weeks old and remain in the fields until they are moved into the fattening house at about twelve weeks. From that age they are either fed to obtain a weight of 200 lbs at 26 weeks for bacon (or heavy pigs of 260 lbs at 30 weeks) or they are fed to a weight of 120 - 150 lbs at 20 weeks for pork.

The real justification for a good farrowing house is that it helps to increase the number of piglets which survive the weaning period and improve their weight at birth. Although a litter of twelve or more piglets is desirable, the average is little more than nine. But advanced breeding can increase the annual number of litters per sow from $1\frac{3}{4}$ to $2\frac{1}{4}$,

and this is helped by good housing. Moreover, good feeding in a comfortable environment may increase the weight of the piglet at birth from 3½ to 5 lbs. On average two piglets in each litter die before being weaned; in many cases being crushed under the sow. A large litter of heavy piglets achieved more than twice a year and with a low mortality rate, will soon pay for the difference between a well-equipped and an average house.

With a combined farrowing and fattening unit it is usual to plan farrowing so that the batches of piglets enter the fattening house at one time.

Feeding:

Most pigs are fed on meal of different kinds or on meal mixed with water and also skimmed milk or pulped foods when available. The normal pig-house, whether for farrowing or fattening, has a central passage about 4 ft wide with pens on either side of it. The pigman places meal in a manger between each pen and the passage; from a feed barrow which is pushed along the passage, and thus the passage should connect directly with a feed store or feeding kitchen at one end.

Lay-out:

The lay-out of pig housing has a few basic principles. It is possible for a feed passage to have pens on one side only, and this arrangement is suitable for a lean-to construction. A better arrangement is to have a central feeding passage with pens on each side.

Therefore the general building shape is a rectangle, including the pens, with a store sited at one end. There must be access to the store for delivery of meal and access through the dunging passages for cleaning. Usually pighouses are sited parallel to each other with access roads at one end for delivery and at the other for cleaning.

Orientation:

Exposed or damp sites are far from ideal and the buildings should not be located where ventilation will be handicapped. For example, a house should not be sited in stagnant air between trees and other buildings. It is best to have the long axis running North/South, since this allows both sides of the house to receive the sun.

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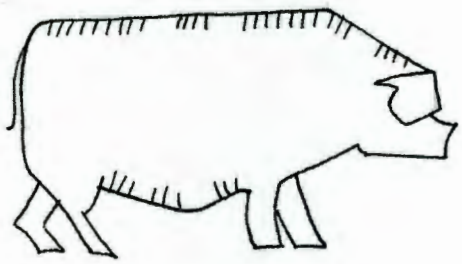


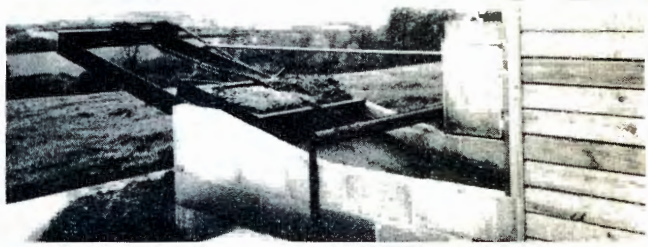


Fig 1 *Ramp at the end of the dung passage with mechanical scraper blade on pulley chain. Dung is deposited onto concrete apron, but normally will be dropped into a trailer. Urine is taken off through a grating into a drain*

Fig 2 *Dung passage of a piggery belonging to W. R. Prince-Smith of Southburn Estates, Yorkshire. It is* 200*ft long and cleaned by a scraper blade drawn the length of the passage on a circulating chain. A floor of timber slats can be installed above the chain. The doors, shown closed against the pop-holes into the pens, can be opened into the passage to form a compartment to each pen. The passage is lit and ventilated by the clerestory windows*

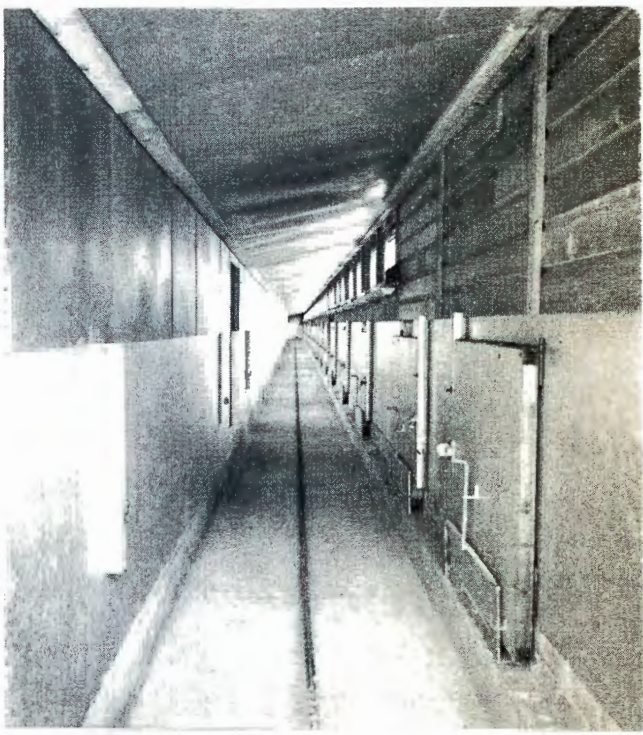


Fig 3 *Pens with open yards*

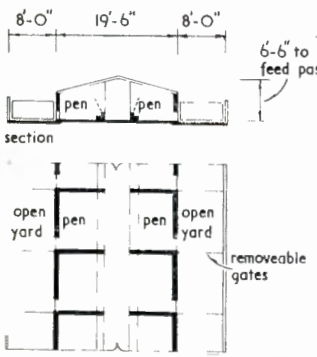
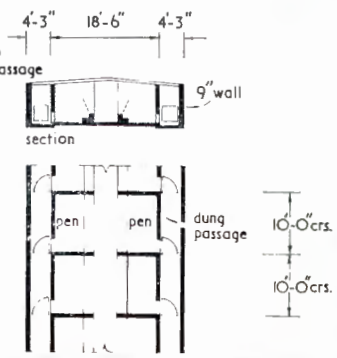


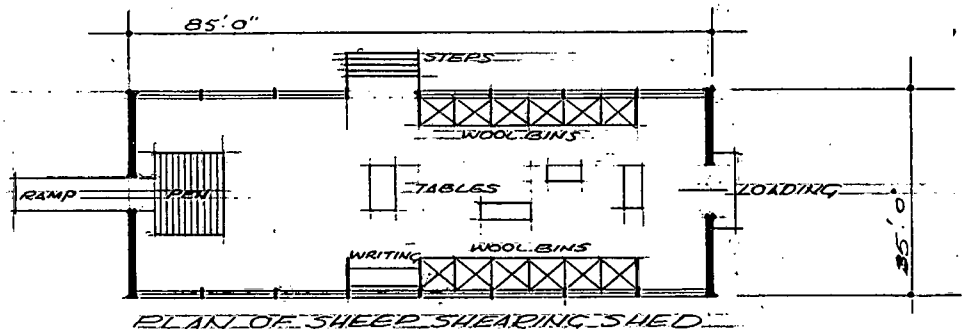
Fig 4 *Pens with dung passage*



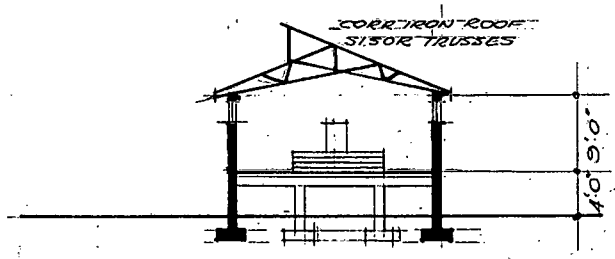
Implements:

The range of implements required on a farm varies according to its function. For satisfactory maintenance it is necessary to house implements under cover, in a good light and with sufficient room between them for a worker to reach each easily. It should be made possible to drive right through the main sheds so that unwieldly machines need not be backed into them. Locked sheds should be provided for the more elaborate or expensive machines. The ground of the implement yard may be covered with gravel or ashes so that tractors can move without damaging the road surface.

Most implements can enter a shed 7 ft 6 ins high at the eaves, but some carts and other implements with shafts need 11'6" or 12'0" height when they are tipped up. Normally, however, with a pitched roof or an arched roof there is sufficient headroom within the building for the higher implements.



PLAN OF SHEEP SHEARING SHED



SECTION

EXAMPLE OF A SHEEP SHEARING SHED AT LANGERUG:

There is a 4'0" headroom under the building which is used as a shelter for sheep in bad weather or on hot days. The catchment enclosure has an open slatted floor for the droppings to fall through. It is collected again from under the building and used for crop fertiliser. The shearing hall is furnished with various shearing tables and grading bins for the shorn wool. A writing table is also provided, as can be seen in the diagram, for recording and book-keeping purposes. Double doors at one end of the shed allow the sheep to enter into the pen where they are caught for shearing. The shorn sheep are placed

back into the pen and when all the sheep in the pen have been cropped they are allowed to escape the way they came in; then the next lot are brought in. The shorn wool, after having been graded, is placed into its allotted bins and later taken to the press tables where they are made up into bales.

They are weighed and ready for loading.

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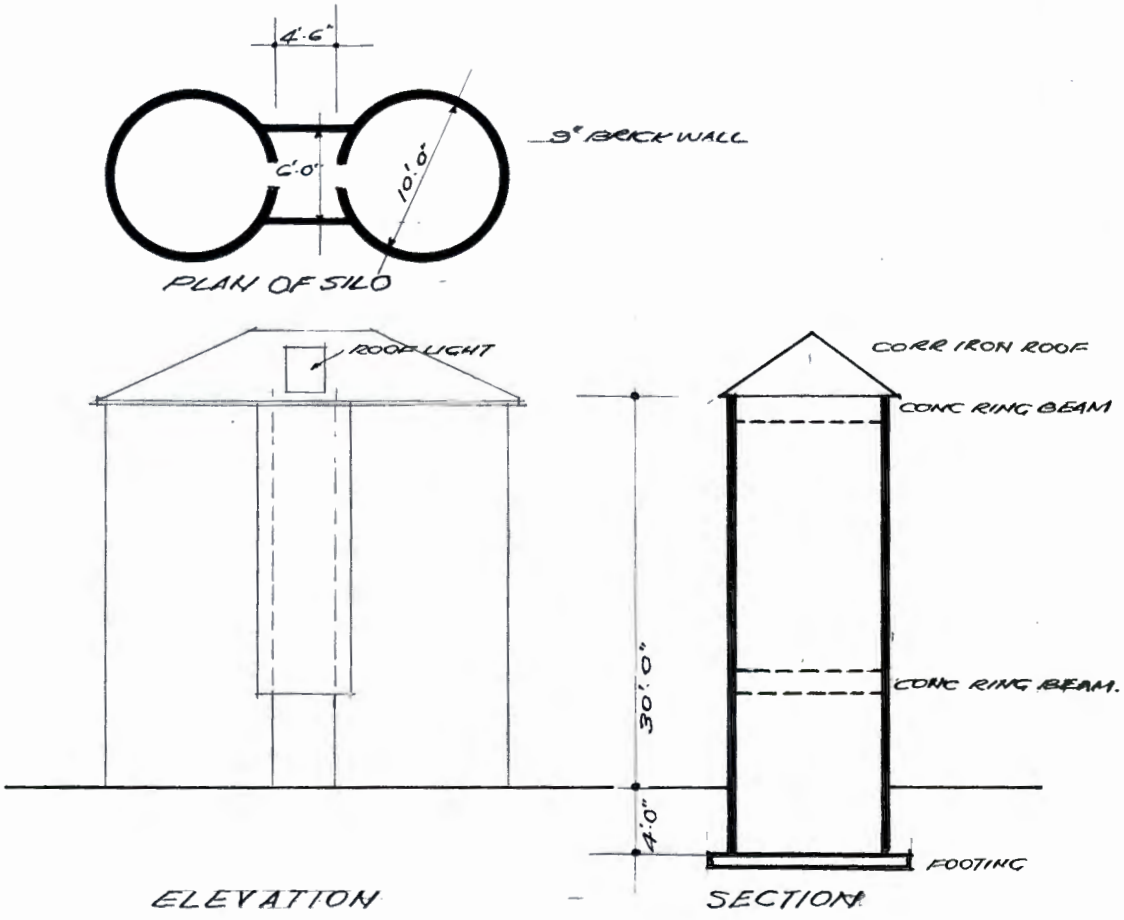
THE DORSY BREED

EXAMPLE OF A SILO AT ELSENBURG:

The loading of the towers takes place in the enclosed area between the silos, through 2'6" x 3'0" hatches. There are four hatches to a tower, each at a higher level to the last, as the level in the silo rised up to the level of the hatch in use it is sealed off. The hatch at the next level is then opened and loading operations continue. The loading area has roof lights in order to allow light to penetrate.



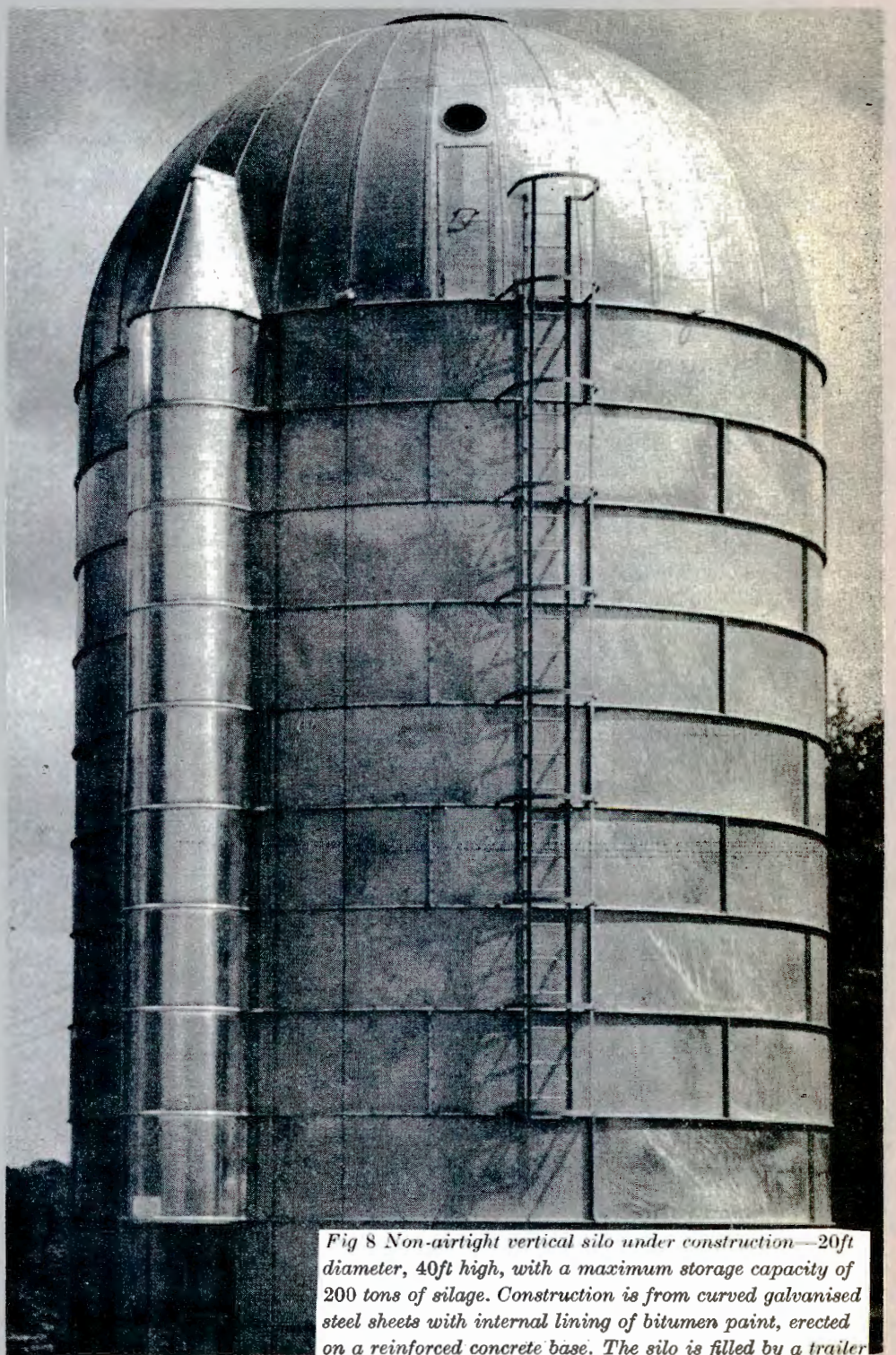


Fig 8 Non-airtight vertical silo under construction—20ft diameter, 40ft high, with a maximum storage capacity of 200 tons of silage. Construction is from curved galvanised steel sheets with internal lining of bitumen paint, erected on a reinforced concrete base. The silo is filled by a trailer tipping at the base from which the grass is augered into a forage blower and blown up a 9in pipe fitted into the circular hole above the trap door at the top. Emptying the silo is achieved by an internal rotating cutter, suspended from the roof, which drops the silage down the external projecting rib

AN AGRICULTURAL HIGH SCHOOL AT CERES.

This school will more or less be designed along similar lines to Oakdale and Langerug Agricultural High Schools. The training offered, will be the same, as well as the syllabus. Farming activities will vary slightly in order to represent this particular district and fit in with climatic conditions. The school will provide accommodation for 120 boys and a teaching staff of five instructors and a principal. Housing and accommodation will also be provided for two foremen, a farm manager (all of whom will be married men), a matron, three assistant matrons and four domestic servants sleeping in.

Type of Farming Activities:

Cultivation:

Various types of grain will be cultivated, but to a lesser degree. The cultivation of fruit trees will be of greater importance and such fruits as apples, peaches, pears, grapes, plums and prunes will receive priority, especially peaches. Vegetables will be grown for the kitchen, as well as lucern for the livestock.

Livestock:

The livestock on the farm will be as follows:-

50 Milking cows for the supply of dairy products. For this purpose the Jersey breed mainly, will be employed.

2 Bulls for breeding purposes.

8 Horses.

500 Merino Sheep, which the farm will support, but will also be provided with winter grazing in bad years.

15 Breeding sows and 2 Boars.

Approximately 700 Chickens, Turkeys, Ducks, etc., will be kept on the farm for the supply of eggs and meat.

Children Attending School:

The boys attending the school will be the sons of farmers of the district which the school represents. Boys from outside the district may also be admitted, but only if there are vacancies, after enrolment for the new year has been closed.

The district served by the school is of modest size compared with Oakdale. It stretches from as far as and up to the Roggeveld Mountains to the East and as far North as the Calvinia district. It also serves the narrow strip of Highlands to the

West known as the Koue Bokkeveld. These areas include a large variety of farming activities, namely, grain, sheep, fruit and mixed farming, etc.

School Routine:

The boys will actively take part in the farming chores, under supervision of their instructors, farm foreman and farm manager. Theory and practical training will be alternated. The time-tables will be so complied that one week will be alotted to a section of the boys for practical work on the farm, while the other group will be attending classes in theory. The reverse will apply for the following week. The group for the practical training week will be expected to rise at a quarter-to-six in the morning and be dressed and ready by six o'clock, when farm work will commence. They will perform such duties as the milking of the cows, skimming and separation of milk, and the swabbing down and cleaning of dairy and cow shed. They will also be employed in the fields performing such jobs as hoeing, ploughing, pruning, etc.

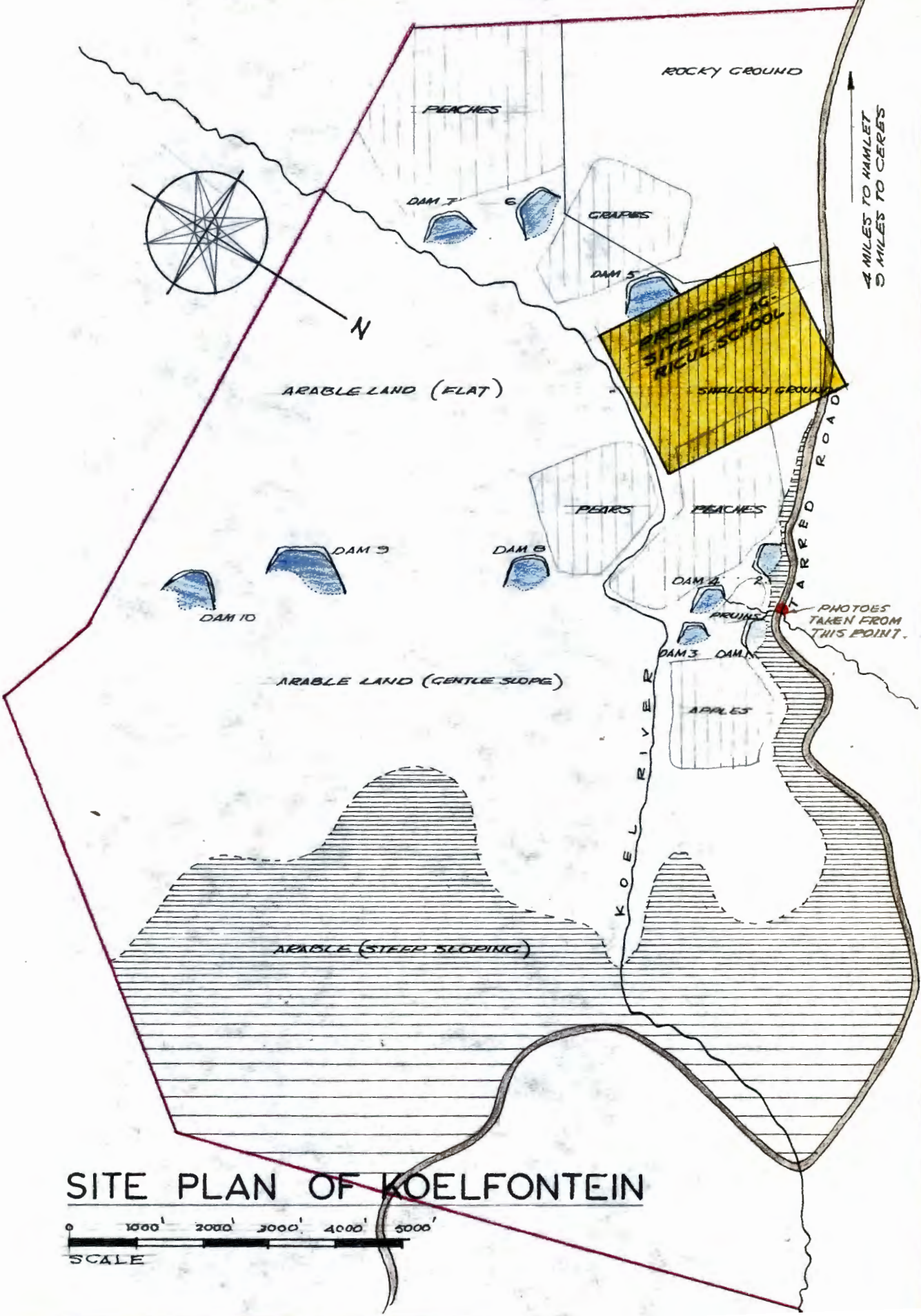
In the wool season they will take part in sheep-shearing activities, grading, weighing and baling of wool. While performing these duties an instructor is continuously present demonstrating, advising and teaching the pupils.

The group doing their theoretical week will rise at 7.45 a.m., and have an hour in which to dress and breakfast. Classes will commence at 8.45 a.m.and end at 3.00 p.m., with a lunch break of an hour in between. There will be a compulsory solitary study period of an hour before supper and another hour period after supper. Pupils will spend their spare time in the library, reading rooms, recreation hall provided, or in outdoor sporting activities. During the weekend (Saturday and Sunday afternoons) they will be permitted to visit Ceres if they so desired. They will be allowed to go home two week-ends per quarter.

The Site:

The site chosen is situated nine miles out of Ceres on the road to Citrusdal. The farm known as Koelfontein, lies at the foot of the Gydo Mountains, which forms the dividing line between the Koue Bokkeveld and the Warm Bokkeveld. The area enjoys a winter rainfall climate and although it can be cold in the winter months, the extreme conditions of the Koue Bokkeveld is not experienced.

The farm belongs to Mr. F.H. Conradie, a prosperous farmer of the district, and is 1,500 morgen in extent. The farm is 1,200 feet above


ROCKY GROUND
PEACHES
DAM 7
6
GRAPES
DAM 5
PROPOSED SITE FOR AGRICUL. SCHOOL
SHALLOW GROUND
4 MILES TO HAMLET
5 MILES TO CERES
N
ARABLE LAND (FLAT)
TARRED ROAD
PEARS
PEACHES
DAM 9
DAM 8
DAM 4
2
DAM 10
RUINS
PHOTOES TAKEN FROM THIS POINT.
DAM 3
DAM 1
ARABLE LAND (GENTLE SLOPE)
APPLES
KOEL RIVER
ARABLE (STEEP SLOPING)
SITE PLAN OF KOELFONTEIN
0
1000'
2000'
3000'
4000'
5000'
SCALE

sea level and although there are heavy tracts of land adjoining the mountain, the low-lying areas are fairly flat and suitable for building on. The farm has an ample water supply with dams strategically placed for irrigating the lands. These are water catchment dams depending on rainfall and mountain streams. Two large existing dams on the farm are fed by strong mountain streams all year round. The only borehold (Borehole gives 8,000 gallons per hour) on the farm worth mentioning is situated a few hundred yards from the existing homestead, the water supply of which is rather meagre for irrigational purposes, but more than sufficient and very suitable for domestic purposes. A little river which has its source in the nearby mountains, flows down from the foothills and meanders its way through the farm practically dividing it in two.

The tarred road from Ceres, via Hamlet, passes along the Southern boundary of the farm. The road has a good surface and is wide enough for fast moving traffic. The nearest railhead is at Hamlet, 4 miles from the farm. This will prove most convenient for delivery and dispatch to and from the farm.

Existing Fruit Trees, etc., on the Farm:

7,000 Peach trees taking up approximately 30 morgen.

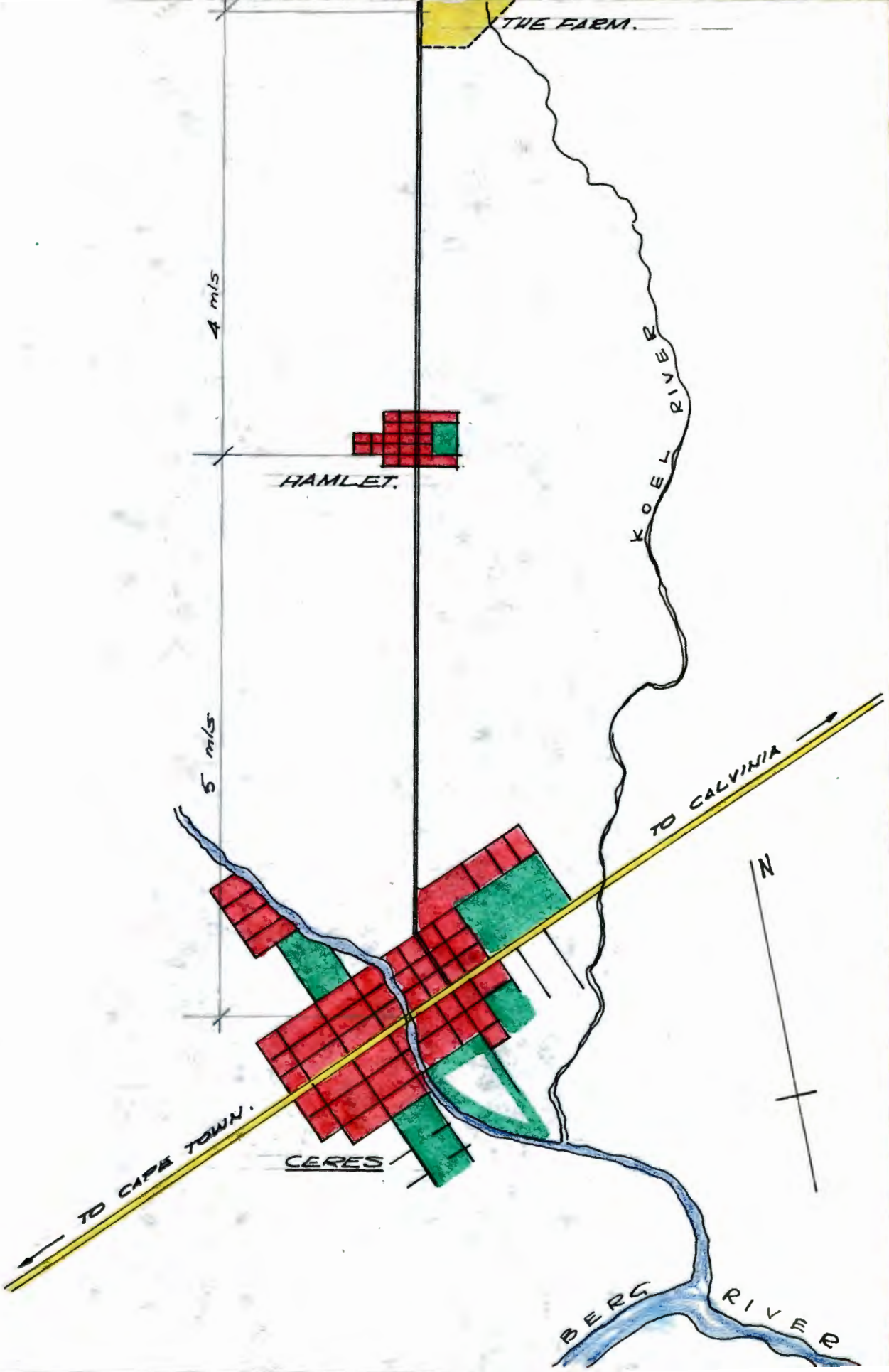
± 1,000 vines and a smaller number of pears, apples and prunes. (An experiment has been made with olive trees). Various types of grain and also Lucern is grown yearly.

The farm has at present approximately 700 morgen under cultivation.

Livestock:

The farm has good pastural lands and can support far more cattle than needed for the purposes of an agricultural school. It can also support up to 1,000 sheep, without sending them to the Karroo for winter grazing, provided food provisions have been stored to see them through the winter months.

In choosing this farm I have taken into account all the requirements expected of an agricultural high school, namely, size, formation of land (as regards to hillyness), water supply, proximity to social and cultural centre, distance from railhead, quality of soil (representative of district), service roads, orientation, availability of electric power (Escom power available).

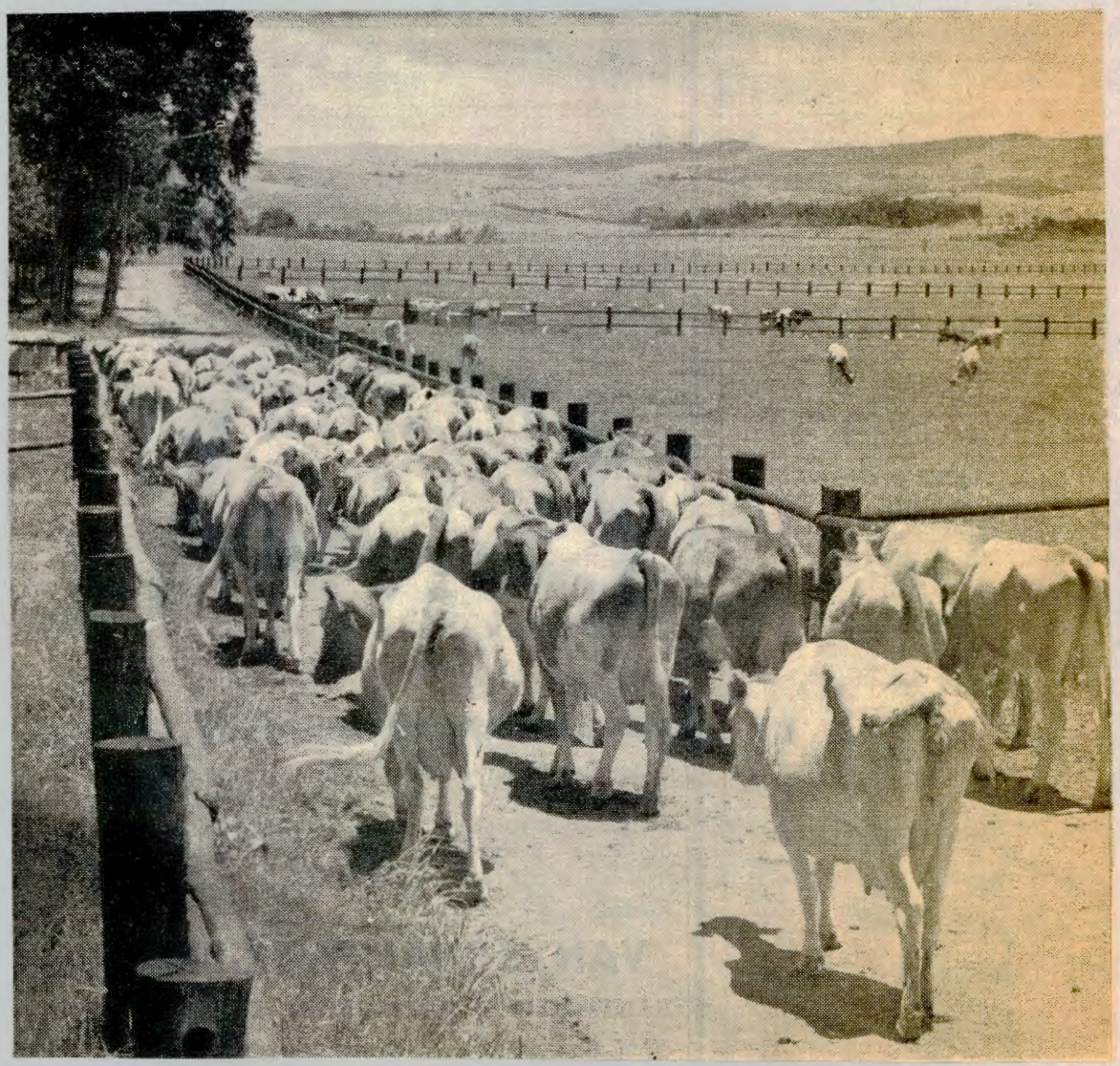

THE FARM.
4 m/s
HAMLET.
KOEL RIVER
5 m/s
TO CALVINIA
N
TO CAPE TOWN.
CERES
BERG RIVER

A SMALL DAM

THE FARM LANDS

LOOKING ONTO THE SITE

THE EXISTING FARM BUILDINGS



THE MILKING HERD

LIST OF ACCOMMODATION REQUIRED.

The Scheme as a whole will consist of the following Buildings:-

1. The Hostel - to house 120 boys.
2. The School Building.
3. Multi-purpose Hall.
4. Principal's House.
5. Superintendent's House.
6. Three Houses for Instructors.
7. Farm Manager's House.
8. Houses for Farm Foremen.
9. Labourers' Cottages.
10. Tennis Courts and Playing Fields.
11. The Farmyard Buildings.

THE FARMYARD BUILDINGS.

List of Requirements in Detail:

Cowhouse and Barn

Stable for 40 Milch Cows	4,500 sq. ft.
Broom Store	50 sq. ft.
Food Stores, Food Mixing and Trolley Store	3,200 sq. ft.
Barn Area.	4,500 sq. ft.

Calf House:	2,750 sq. ft.	
Consisting of:-		
3 Confinement Boxes	150 sq. ft.	each.
2 Bull Pens	150 sq. ft.	each.
12 Calf Pens (newly born)	25 sq. ft.	each.
2 Large Pens for Young Calves	300 sq. ft.	each.
Quarters for Cow Hand	250 sq. ft.	

Young Stock Yard:	2,500 sq. ft.	
Exercise Yards for Bulls: (2)	400 sq. ft.	each.

Hefer Shelter:	2,500 sq. ft.
Loafing Yard	6,000 sq. ft.
Stable Horses:	1,200 sq. ft.
Harness Room	150 sq. ft.
Store	50 sq. ft.
Sheep Shearing Shed:	3,000 sq. ft.
Dutch Barn:	3,000 sq. ft.
Piggery:	
Food Store and Preparation	1,300 sq. ft.
Fattening House	3,250 sq. ft.
Breeding House	3,250 sq. ft.
Weighing Area	500 sq. ft.
Hospital (Cows).	800 sq. ft.
Fruit Packing Shed:	1,300 sq. ft.
Machine Shop:	3,000 sq. ft.
Store	1,000 sq. ft.

Woodwork Shop:	2,000 sq. ft.
Store.	1,000 sq. ft.
Garage for 4 Large Lorries:	2,000 sq. ft.
General Stores:	5,000 sq. ft.
Implement Shed:	1,800 sq. ft.
Tool Shed:	1,000 sq. ft.
Oil Store:	400 sq. ft.
Shed to house 6 Tractors:	
4 Seed Stores with Loading Platform:	150 sq. ft. each.
5 Fertiliser Stores with Loading Platform:	150 sq. ft. each.
Incubator House:	600 sq. ft.
Poultry Food Store	800 sq. ft.
Egg House	250 sq. ft.

Closed Shed:

Housing Expensive Machinery, Combine, Elevator, etc. 1,000 sq. ft.

REMARK:

Owing to the size of the subject chosen and the time allowed for the completion thereof, only the design of the Farmyard buildings will be dealt with in detail.

This may therefore be more correctly called:

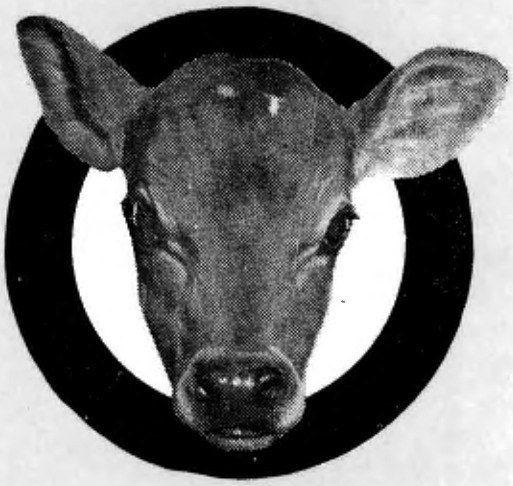
A THESIS ON THE FARMYARD BUILDINGS FOR AN AGRICULTURAL HIGH SCHOOL AT CERES.

In order for the various other buildings, such as the Hostel, School and Personnel Houses, to be plotted on the layout plan, it was necessary to give some thought to these buildings, as to their shapes and sizes in relation to the Farmyard Buildings.

NOTE:

All catchment dams, orchards and other landmarks shown on the site plan are existing.

The levels were obtained from the firm Messrs. Dowson & Dobson, who have recently surveyed a portion of the farm for irrigation purposes.



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