Agricultural Science Practical

Agri Aware's Farm Walk and Talk for second level students

Delivered by: Agri Aware, IASTA, Teagasc and Agri Aware's patrons

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I.A.S.T.A
irish agricultural science teachers' association

teagasc
Agriculture and Food Development Authority

family farm
Family Farm, developed by Agri Aware and Dublin Zoo

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Student Notes

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Practical Demonstrations for Agricultural Science Students

SOILS AND FERTILISERS

1. To examine a (named) soil profile on the farm e.g. Brown Earth, Gley, etc. and discuss various characteristics of the profile e.g. drainage, colour, use(s), etc.

GLEY SOILS

Characteristics

- Gley soils form on areas of rolling lowland or gentle sloping hillsides. They suffer from frequent water-logging (West of Ireland ~ +205 rain days annually). There are two types. Surface Water Gleys develop due to a perched water-table over an impermeable layer and Ground Water Gleys develop where water-table is near surface due to low position or depression in topography.
- In poorly drained gley soils, periodic or permanent water-logging can cause the B horizon (subsoil)to experience a lack of oxygen within the pore space and cause mottled greenish-blue grey patches. On exposure to the air, the colours change to a mottled pattern of reddish, yellow or orange patches.
- Gleying occurs where soils are waterlogged because the air is excluded and the supply of oxygen is reduced.
- Gley soils are sticky and hard to work. Gleys have a limited use range: usually rough grazing or forestry. Drainage has allowed many of the better gley soils to be developed for agricultural use, often as productive grassland for dairy or beef cattle production. Stock will have to be removed during the winter to prevent poaching. However, with careful draining and liming the potential of this land is hugely increased e.g. mole drains (15cm deep).

BROWN EARTHS

Characteristics

- The soils are characterised by a dark brown surface layer called the A horizon which contains most of the organic matter. Below this is a brown layer called the B horizon, and further down is the parent material which may be rock or sediment.
- Brown Earths are deep, well drained fertile soils with a wide use range. Leeching of minerals has taken place but sufficient minerals remain. However, fertilisers are required to maintain nutrient levels.
- Given their adequate depth, free drainage and relatively high natural nutrient levels, these soils are amongst the most fertile and are used extensively for agriculture, some of which is intensive and specialised, for example winter vegetable production.
- Parent material: can form from granite and are called Acid Brown Earths. These are top tillage soils e.g. Clonroche series in Co. Wexford.
- Brown Earths occur in Wexford, Waterford, parts of Down and Louth and small areas of Co. Cork and are all excellent producers of grass for the liquid milk market.

PODZOLS

Characteristics

- Derivation: from the Russian words pod = under and zola = ash
- The word is of Russian origin and is used to describe the whitish upper layer in the soils from which soil constituents have been leached and re-deposited further down. This soil type is typical of those formed in the colder, northerly regions.
- These soils are among the most acidic in the country. They are strongly leached soils and devoid of many nutrients particularly in the upper layers. Their B horizons have layers of humus, iron and sometimes aluminium washed down from the upper parts of the soils.
- The light coloured E horizon, a direct result of loss of iron/aluminium oxides following long-term weathering in the presence of organic acids, rests on a brightly coloured zone of iron/aluminium deposition (the B horizon) or on a darker zone of organic deposition. The relatively unaltered C horizon is present at variable depth.
- Parent Material: Acid rocks e.g. sandstone, granite or schist derived.
- Podzols are generally infertile, non-productive soils. By virtue of their occurrence in cool, wet conditions, often within steep hill terrain, they have been used principally for forestry and recreation rather than for large-scale settlement or widespread intensive agriculture: their use for grassland production and stock rearing is important. Where agriculture is practiced, the semi-natural vegetation has been removed, the soil ploughed and the topsoil limed (to decrease acidity) and fertilised (to increase nutrient status). Continual fertilisation is necessary to maintain adequate yields.
- The podzolisation process occurs on free-draining, acidic parent material in high rainfall areas e.g. over Sandstone in Cork and Kerry. Firstly, the surface layers are leached and depleted of nutrients, which then become acidic. Most depletion occurs in the light coloured E horizon (also called A2 horizon). Secondly, the leached aluminium and iron ions accumulate in the B horizon and are often concentrated in a thin, cemented iron pan, called the B2iron. The iron pan then prevents drainage, causing A horizons to become waterlogged. The main plants tolerating acid waterlogged conditions, at high altitudes, are heathers. Heathers do not decompose properly and form an organic O horizon called Blanket Peat.

Soil Profile

The vertical section or face of a soil may be obtained by digging a trench to a depth of about 3 ft. The face shows a number of layers marked by differences in colour and texture. These layers are called horizons, and are more pronounced in the profiles of uncultivated land than in those of cultivated areas. There are usually four horizons in the profile: O, A, B, and C in descending order. The A-horizon is the uppermost layer in mineral soils and corresponds closely with the so-called ``surface soil''. It is the part of the soil in which living matter is most abundant

and in which organic matter is usually most plentiful. Being closest to the surface, this horizon is the first to be reached by rainfall and is therefore more leached than underlying horizons. The B-horizon lies immediately beneath the A and correspond closely to what is called the sub- soil. It has less living organisms than the A-horizon. The B-horizon is one of accumulation or deposition It usually has a high content of iron and on products are iron oxides (formation of iron pan or mottling of iron) or humus or both. The C-horizon refers to the geological material beneath A and B- horizons. It consists of loose and partly decayed rock or other geological material. Glacial drift, similar to that from which the soil has developed, is present also and may have accumulated locally by the breakdown of the native rock or it may have been transported by ice. The C-horizon weathers less, has less organic matter and is usually lighter in colour.

2. To demonstrate the correct procedure for taking soil samples(s) in a field i.e. W-shaped, soil auger, etc.

SOIL SAMPLING

The area should be observed to identify:

- The topography and slope of the land— hilly, flat etc.
- The drainage systems present—has the land been drained recently? Is there evidence of mole draining? Are the drains clean or overgrown?
- The current use of the field — is it left lying idle or is it currently being use to grow crops?
- The history of the land — has it always been one field? Has a hedgerow been removed? Was it recently limed, etc.?
- The differences in colour — e.g. if currently in grass, is there lush, leafy green grass or pale yellow/brown?
- Particular species of plants present may indicate current pH — e.g. rushes, moss etc. in an acidic pH or bad management practices may
- lead to docks, thistles or nettles etc. To ensure that an accurate representative has been taken from the field, samples must be taken from a ''W'' shape. Areas such as gateways, headlands and marshes should be excluded. A minimum of 25 samples should be taken from root zone using an auger. The samples are mixed to give a ''composite'' sample. The sample is then analysed to determine its current nutrient status and its requirements for minerals, such as calcium, potassium and nitrogen etc. Most farmers send their samples to the Teagasc Soil Testing Unit in Johnstown Castle, Co Wexford.

HOW TO DETERMINE SOIL TEXTURE

THE 'FEEL' METHOD

Materials and Apparatus

- Samples of soils of contrasting texture, magnifying lens, water

Procedure

- Using a sample of sand, carry out the following steps.
- Examine sample under a lens and note the proportion of large and fine grains.
- Handle it and note the feel.
- Moisten the soil with water and knead with fingers.
- Estimate the texture using the table on page 38 of the George Mullen 'Agricultural Science' book.
  Repeat steps for a clay sample. Record results and compare to classmates.

MECHANICAL ANALYSIS

Materials and Apparatus

- Dry Soil sample and set of sieves.

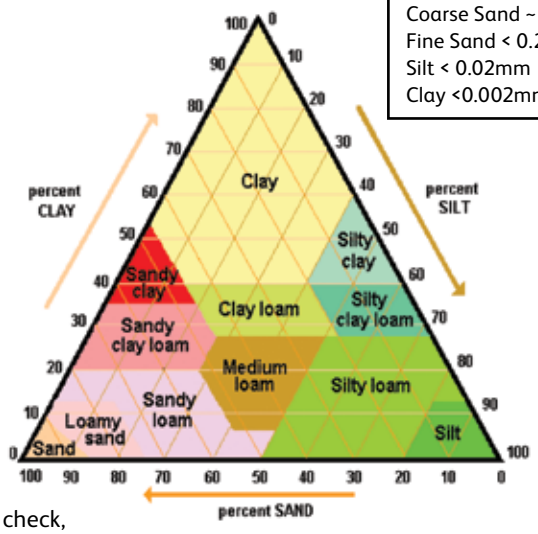
Method

- A known weight of a dry soil particle is placed in the top sieve.
- Shake vigorously.
- Weigh the clay fraction.

Result

$\frac{\text{Clay}}{\text{Total}} \times \frac{100}{1} = \%\text{Clay}$

SOIL TEXTURE
Gravel > 2mm
Coarse Sand ~ 2mm
Fine Sand < 0.2mm
Silt < 0.02mm
Clay <0.002mm



DETERMINATION OF SOIL TEXTURAL CLASS

Materials and Apparatus

- % Sand, silt and clay values of soils, soil textural triangle, ruler, pencil.

Procedure

- Sample soil values of 15% sand 70% silt 15% clay.
- Taking the soils percentage clay of 15%, find the value on the clay scale and draw a line parallel to the bottom of the triangle.
- Taking the soil silt percentage to be 70%, find the value on the silt scale and draw a line parallel to the left side of the triangle.
- The area in which they overlap or intersect will determine textural class. As a check, taking the sand percentage to be 15%, find the value on the sand scale and connect i.e. Silty Clay loam.
- Repeat this procedure to determine other samples. The % of each particle can be estimated using sieves.

3. To study the spreading pattern of a fertiliser spreader.

BASIS FOR RECOMMENDATIONS OF FERTILISER APPLICATIONS

While many factors influence fertiliser applications for individual crops, two broad principles apply:

i. Crop responses to fertiliser applications.

ii. Maintenance of satisfactory soil nutrient levels so that maximum yield can be achieved with the appropriate fertiliser.

Fertiliser application

Fertiliser may be applied in three ways:

i. Placed in a band near sown seeds.

ii. Broadcast on the soil surface.

iii. Top-dressings on growing crops.

Straight and compound fertilisers are available in granulated form which facilitates spreading as follows:

i. Reduction in hydroscopicity fertilisers do not cake and block the fertiliser spreader.

ii. Uniform and accurate spreading is possible.

Fertilisers

Crops obtain their nutrients from the soil. Plant nutrients are available to plants from the following sources:

i. Soil e.g. release of nutrients from soil minerals or from the breakdown of soil organic matter.

ii. Organic manures e.g. excretions of farm animals while grazing, spreading of slurry, dung, etc.

iii. Atmosphere e.g. Nitrogen fixation as a result of the symbiotic relationship of Rhizobia bacteria and clover.

iv. Chemical fertilisers e.g. application of mineral fertilisers and lime.

The nutrient requirements of plants

Crops need a balanced supply of essential nutrients in order to grow well. These nutrients are normally dissolved in water in the soil to form the soil solution. From the soil solution, these nutrients are absorbed by the roots as ions. Table 1 contains a list of these essential nutrients and their respective ions. Also see last week's article, 'Nitrogen Cycle'. Potentially negative aspects involved with the use of fertilisers

a. Overuse and/or misuse of fertilisers could lead to environmental problems, e.g. pollution of rivers and lakes.

b. Unnecessary applications of fertiliser will cause an 'extra' cost and hence a reduction in profit.

c. Abnormal presence of one element could cause the plants to be unable to extract another element from the soil solution. A sensible programme of soil testing will ensure that there will be a balanced supply of the necessary nutrients available to the crop and hence will reduce or eliminate the above negative aspects associated with the spreading of fertilisers. Farmers must abide by a code of 'Good Farming Practice', which ensures the effective use of fertilisers

Fertilisers and manures

Fertilisers are manufactured materials, mainly inorganic in nature. Manures are of animal and plant origin and are organic in nature.

Fertiliser products - mineral fertilisers are made from naturally occurring raw materials containing nutrients that have normally been transformed into a more plant-available form by industrial processing.

Fertilisers are manufactured from the following raw materials:

i. **Atmospheric nitrogen** - converted to ammonia or nitric acid in the Haber Bosch process.

ii. **Mineral rock phosphates** - naturally insoluble in water, can be made more soluble by treating the rock with a mineral acid and then neutralising with ammonia.

iii. **Natural potash salts** - mostly composed of potassium chloride. Only needs to be washed and re-crystallised in order for it to be suitable for use as a mineral fertiliser.

The physical form of fertiliser products

The majority of the fertilisers used in Ireland are straight or compound fertilisers applied mainly in a solid form. Straight fertilisers contain only one nutrient, e.g. calcium ammonium nitrate (27.5%N).Compound fertilisers contain two or more nutrients, eg. 18% N, 6%P, 12%K - used for silage and hay. Most fertilisers are sold in granular or prill form so that they can be broadcast using mechanical spreaders.

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Straight Fertilisers

Nitrogen fertilisers –nitrogen is an essential component of amino acids and, therefore, of proteins which include: nucleic acids; enzymes and chlorophyll. Nitrogen is the nutrient, which normally produces the greatest yield response in crop plants. Most nitrogen is taken up by plants as nitrate. Since nitrates are very soluble in water, care must be exercised so that nitrates are not leached out of the soils into rivers and lakes with consequent environmental problems. It is recommended for example, that all nitrogen fertiliser be applied by early to mid-September.

Common nitrogenous fertilisers

(1) Calcium ammonium nitrate (CAN), 27.5%N, chemical formula is NHNO+ Ca CO. Half of the nitrogen (13.75%) is in the ammonium form and the other half is in the nitrate form. The ammonium ions (NH) have an acidifying effect in soils, which is counteracted by calcium acting as a buffer against this acidifying action.

(2) Urea (46%N), chemical formula is CO (NH). It is slower-acting than can because the nitrogen must be converted from the ureic form to the ammonium form (i.e. Ammonium carbonate) and hence to the nitrate form. This conversion process is facilitated by the presence of nitrifying bacteria and is favoured by moist, well-aerated, warm, high-pH soil conditions.

The main agronomic limitation of urea results from the instability of the ammonium carbonate. When urea is used as a top dressing in warm dry weather it can release free ammonia gas, which is lost to the atmosphere (i.e. volatilisation). When urea is incorporated into the seed-bed it can be toxic to germinating seeds of tillage crops. It is recommended that urea be used as a top-dressing on established crops and only when there is a strong likelihood of rain. Sulphate of ammonia (21%N) chemical formula is (NH) SO. Infrequently available nowadays. Can cause soil acidification and when used as a top dressing some ammonia is lost by volatilisation.

Phosphorus fertilisers

Phosphorus is essential for photosynthesis, plays a part in the working of the cell nucleus, and it stimulates root development. Generally soil phosphorus bonds strongly to soil minerals.

Common phosphate fertilisers

(i) Superphosphate -(7%P).Chemical formula is Ca (HPO) + Ca SO. It is suitable for all crops on all soils

(ii) Triple superphosphate (16%P).Chemical formula is Ca (HPO) similar to superphosphate in that it is suitable for all crops on all soils.

(iii) Ground Rock Phosphate(14.5%P).Chemical formula is Ca PO. The phosphate present becomes available for uptake over a long period in acid soils so it is particularly suitable for forest tree fertilization and for maintenance applications on established grass in high rainfall upland areas.

Potassium fertilisers

Potassium maintains the salt balance in plant and animal cells and is important for healthy metabolism. Potassium is found as potassium chloride (KCl) often known as potash, which is derived from weathered rock. Annual applications of potash are necessary on sandy soils because of their low action exchange capacity, which results in the level of potassium not building up. Plants have the capacity to take up luxury amounts of potassium, which may reduce the uptake of magnesium leading to crop deficiency and grass tetany in farm animals. High potassium can also increase the severity of boron (B) deficiency in susceptible tillage crops.

Common potash fertilisers

(1) Muriate of Potash (50%K). Chemical formula is KCl. This product is mine and with washing and recrystallisation is available for use.

(2) Sulphate of Potash (50%K). Chemical formula is KSO. This product is manufactured and is therefore more expensive than Muriate of potash. Used in compound fertilisers which are adversely affected by too much chloride.

Testing silage quality at the pit face

These are tests easily carried out by the farmer to get a rough idea of the quality of his/her silage.

(1) Look: A yellowish green colour indicates a better quality than a blue-green colour.

(2) Feel: Mushy silage is bad. The structure of the ensiled herbage should still be present.

(3) Smell: A sweet, pleasant smell indicates lactic acid
A stinging smell of vinegar means acetic acid
A foul smell of rancid butter means butyric acid.

(4) Squeeze: If hardly any liquid can be squeezed out, then DM > 25.
If there is a steady flow of drops, then DM = ~20.
If there is a stream of liquid, then DM < 15 (Try it out then check in the laboratory to verify).

(5) Check pH4: use pH test paper.
pH4 -4.1 is very good.

4. To determine the quality of silage at the silage pit (using texture, colour, smell, % DRY Matter (D.M.) (using "hand squeezing technique), pH, leaf/stem ratio, etc.).

PRINCIPLES OF SILAGE MAKING

- Fresh cut grass is naturally covered with millions of bacteria
- The cutting process causes cells to burst, releasing carbohydrates
- Tightly compacting the silage is vital to achieve an anaerobic environment.
- The Anaerobic bacteria involved in good quality silage making are Lactobacillus and Streptococcus
- The acids produced lower the pH and eventually, stop bacterial activity (preserved)

Silage Types

- Lactic Acid Silage: When the carbohydrate level is high in grass. The sugars are used by the bacteria and lactic acid silage is formed. This is highly palatable, nutritious and lasts for years. Silage with a good lactic acid content is light brown in colour, has a sharp taste and little smell. It is very stable and can last for years.
- Butyric Acid Silage. When the carbohydrate levels are low. The sugars are used by Clostridium which results in unpalatable, less nutritious silage which stores badly. Butyric silage is olive green in colour, has a rancid smell and is unpalatable to stock.

In order to achieve a high level of carbohydrates, it is necessary to:

- Cut the grass at the young leafy stage when sugars are high
- Cut in dry conditions as water dilutes the sugar levels
- Grass should be allowed to wilt for 1 to 2 days after cutting. Increases sugar content
- Cut using a precision chop harvester as this cuts the grass very small which increases the surface area for bacteria to work on
- Use a carbohydrate rich additive such as Molasses
- Mow in the afternoon. This is because there has been more photosynthesis and consequently, more sugar

5. To observe and explain different grazing systems on the farm e.g. paddock, strip, block, mixed, etc.

6. Explanation of grazing management, requirements, etc. - the "wellington technique".

INTRODUCTION

Grassland occupies a major part of the agricultural land of Ireland (90%). The major function of grassland on farms in Ireland has traditionally been to supply feed for livestock either through grazing or after conservation as hay, silage or haylage. Grass is the most important source of nutrients for ruminants in Ireland supplying some 70% of Metabolisable Energy (ME).

Good grassland management involves:

- Deciding on the amount of herbage output which is required
- Applying enough fertiliser to obtain this amount
- Managing utilisation (grazing and conservation) to maximise the intake of digestible dry matter

Grassland management concerns the utilisation and production of grass. Farmers need to provide their livestock with grass or conserved grass (silage and hay) that is of the right palatability and nutritional quality. In this respect livestock have very differing requirements. Dairy cows need lots of young nutritious grass or silage to support milk production whereas beef cattle do best on grass that is more mature and of lower palatability.

Stocking Density

The correct stocking density is very important to grassland management. If under stocking occurs, grass is left uneaten and therefore, wasted. It also becomes more indigestible and unpalatable. However, overstocking leads to over grazing and little overall growth. It also leads to the growth of weeds because grass becomes less aggressive. To prevent these problems, always apply the correct stocking rate and increase or decrease stocking rate at different times of the year when grass growth is at its highest/lowest. Also adjust stocking density according to the size of the animal.

Understanding Grassland Management

In order to understand grassland management, it is necessary to understand how grass grows.

1. Grass does not grow all year round. Growth begins in spring as soon as the temperature rises above 6°C.
2. Pastures should be well grazed down before livestock is housed the previous autumn.
3. Grass should be grazed to approximately 6 to 7cm. This is because palatability and digestibility deceases below this which would reduce the animal's performance.
4. Pastures should have a grass break of at least three weeks. This allows the grass to be very palatable, digestible and productive.
5. Grass should be tillered. Tillering is production of side shoots from the main shoot.
6. Grass grows in three stages.
   (i) The remaining part of the cut leaves grow longer
   (ii) The tillers produce new leaves
   (iii) The plant produces new tillers
7. Grass responds well to fertilisers.
8. The D.M.D. of grass is at its peak in mid-May. After that day, it falls by 0.5% per day.

Grazing systems used by farmers vary widely in the degree. However, all are designed to help match the nutritional demands of the livestock with the supply of forage.

Grassland Management involves the following:

1. **Estimating the amount of herbage required for the year.** (1 Livestock unit requires 12 tonnes herbage yearly).
2. **Applying fertiliser to achieve the herbage required.** Soil tests must be carried out to determine the existing levels of nutrients in the soil. The amount of fertiliser spread depends on projected levels of production, the intended use of the grass (silage, grazing) and also grazing intensity and stocking rates. Soil pH must be regulated by addition of lime.
3. **A controlled grazing system**. Grass should ideally be short, leafy, palatable, digestible and productive. This is best achieved by a care fully controlled system of rotational grazing.

GRAZING METHODS

Zero Grazing

- Animals are confined to a yard
- Not used in Ireland
- Used where land is very fragmented over a large area
- During spring and summer, grass is cut daily and brought into them
- It eliminates poaching

Other grazing systems are used in conjunction with the above systems to enhance productivity and to reduce the incidence of disease.

Leader Follower system of grazing

- Where younger animals are kept one paddock ahead of the rest of the herd
- Younger animals are more susceptible to disease than older animals. They are also more likely to pick up stomach worms. This system reduces the chances of this happening. The are also selective grazers which mean they eat only the most leafy, palatable and digestible grass

Mixed Grazing

- This system is where sheep and cattle are grazed together
- It increases productivity by 10 to 15%
- Increases Tillering
- Sheep eat the less palatable grass around the dung paths. This thereby, prevents tufts of grass from forming

Creep Grazing

- Where young stock has access through a creep gate to fresh grass or ration but can return to suckle their mothers at any time. The creep gate is too small to let older animals through.

7. To demonstrate and explain the various characteristics of a typical dairy breed versus those of a typical beef breed.

Agri Aware brings you

Cattle Breeds – Beef

AUBRAC

CHARACTERISTICS

- From Massif Central region in Southern France
- Well muscled, medium sized animals, producing continental type marbling of beef
- Ability to convert low cost roughage such as grass/hay into beef
- Good maternal traits and ease of calving

Further info: **www.aubrac.ie**

BLONDE D'AQUITAINE

CHARACTERISTICS

- From Aquitaine/ Garonne valley in France near the Pyrenees Mountains
- Hardiness, good growth rates, excellent conformation, lean muscling, high killing out %
- Docility, ease of calving, good for cross breeding
- 3rd most numerous cattle breed in France after Charolais and Limousin

Further info: **www.irishblondedaquitaine.ie**

BELGIAN BLUE

CHARACTERISTICS

- Originated in Belgium
- Coat colours – black, white and blue
- Has a "double muscle" gene
- Can be very difficult calving

Further info: **www.ibbcs.com**

CHAROLAIS

CHARACTERISTICS

- Native of the Charolles region in Central France
- Large animal, excellent conformation, deep body, heavily muscled
- Ability for fast growth, leading to high weights and the production of lean meat
- Used for cross breeding

Further info: **www.charolais.ie**

LIMOUSIN

CHARACTERISTICS

- From Limousin region of Central France
- Renowned for top quality hind quarters, the production of muscle and lean meat
- Produce a high % of muscle to bone
- Extensively used for cross breeding and A.I.

Further info: **www. irishlimousin.com**

SIMMENTAL

CHARACTERISTICS

- From the Simmen Valley in Switzerland
- Large docile animals with deep muscled back and loin, top beef quality stock
- Good adaptability, hardiness and good growth rates
- Dual purpose, good milk producers and hence ideal for suckler herds

Further info: **www.irishsimmental.com**

HEREFORD

CHARACTERISTICS

- Originated in Herefordshire in England
- Hardy and able to fatten on a grass only diet
- Produce top quality beef with marbelling
- Widely cross bred with Friesian to produce the familiar black-whitehead offspring

Further info: **www.irishhereford.com**

ABERDEEN ANGUS

CHARACTERISTICS

- Native to the Aberdeen region of Scotland
- Dominant polled gene (i.e. no horns)
- Adaptable, high quality marbled meat
- Easy calving and the breed is used extensively for cross breeding with other breeds

Further info: **www.irishangus.ie**

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Agri Aware, Waverley Office Park, Old Naas Road, Dublin 12. Visit www.agriaware.ie or contact 01-4601108

Agri Aware brings you Cattle Breeds – Dairy

AYRSHIRE

CHARACTERISTICS

- Native to Ayrshire in Scotland
- A pure dairy breed, with a very well shaped udder and teats
- Renowned for its hardiness, adaptability, good foraging and reproductive ability
- Produce milk with high protein and fat content

Further info: **www.ayrshirescs.org**

BRITISH FRIESIAN

CHARACTERISTICS

- From the Friesland Islands and Holland via Eastern England
- Well built animals, with a large appetite and weigh up to 600kg
- Give very high milk yields when well housed and fed on a high plain of nutrition
- Dual purpose breed Have fast growth rates for finishing as beef cattle

Further info: **www.britishfriesian.co.uk**

HOLSTEIN FRIESIAN

CHARACTERISTICS

- From the Friesland Islands and Holland via United States & Canada
- Bred to produce higher milk and protein yields than any other breed
- Bred to make the best use of grass for milk production
- Good feeders but sensitive to cold wet conditions and need early winter housing

Further info: **www.ihfa.ie**

JERSEY

CHARACTERISTICS

- Native of Jersey Islands between England and France
- Pure dairy breed, small size but consume large quantities of herbage
- Yield the highest butter fat content (@ 5% +) of all breeds
- Jersey milk is renowned for its high quality

Further info: **www.tasc.ie/html/jersey.htm**

KERRY

CHARACTERISTICS

- Native of County Kerry, it is one of the oldest breeds in Europe
- Ireland's main surviving native dairy breed
- Well ribbed and fine boned animals, a winter hardy breed
- Produce milk with small fat globules easily digested by babies

Further info: **www.kerrycattle.ie**

SHORTHORN

CHARACTERISTICS

- From North East England. Main dairy breed in Ireland until 1980's
- Three distinct coat colours: Red, White and Roan
- Dual purpose breed, having both dairy and beef qualities
- Blocky build enables the production of good beef carcases

Further info: **www.irishshorthorns.com**

MONTBELIARDE

CHARACTERISTICS

- From Franche-Conte, Jura Mountains, France
- Two distinct coat colours: Red and White
- Dual purpose breed, having both dairy and beef qualities
- Very hardy, well suited to harsh climates

Further info: **www.iol.ie/~gibo/**

ROTBUNT

CHARACTERISTICS

- Native to Northern Germany
- Coat is coloured red and white
- Dual purpose breed, having both dairy and beef qualities
- Very high protein content

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Agri Aware, Waverley Office Park, Old Naas Road, Dublin 12. Visit www.agriaware.ie or contact 01-4601105

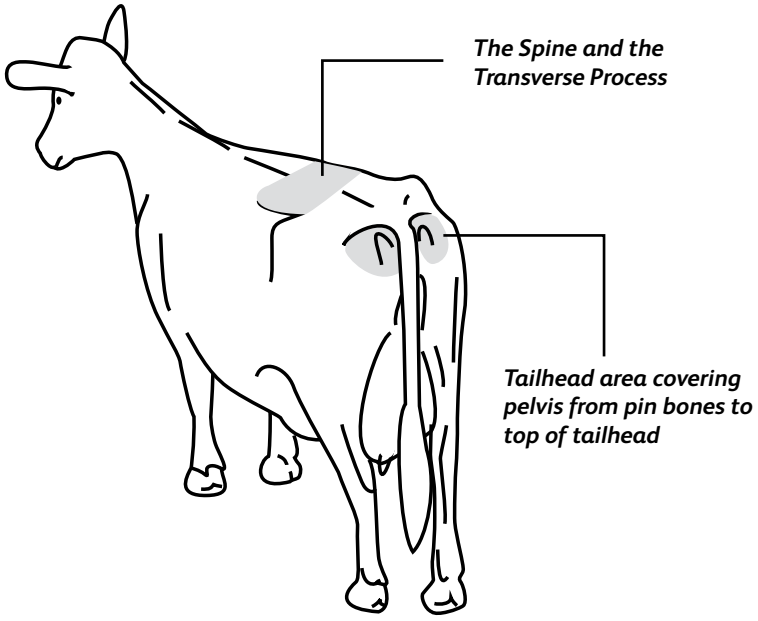
8. To demonstrate how to assess the body condition score of a dairy cow and a sheep.

Definition:

- Condition scoring of farm animals is a method of quantifying, by means of a number, the ranges of condition (fat cover) that animals may be at, at various times of the year.
- The scoring system is based on the manual palpation of the quantity of subcutaneous fat (fat under the skin) over various parts of the body: the spine, the transverse processes, plus the tail head and ribs.
- The scale for cows and sheep range from 0 – 5, (0=thin 5=fat) while the scale for pigs is 1-9.

Condition Score Targets for the Dairy Herd

- The condition score targets vary over the production cycle of the cow during the year.
- At drying off, aim to have the cow at a condition score of 2 –2.5. On a good quality diet, a cow should gain one point over the dry period to reach a condition score of 3-3.5 at calving.
- Young cows and very thin cows may require a longer dry period to achieve their desired condition score target.
- If a condition score of 3- 3.5 is not reached at calving, milk yield will not reach its full potential at the following lactation.
- A low condition score at calving may also affect future fertility by delaying the onset of heat due to low energy reserves.
- A very low condition score at calving may compromise the health of the cow resulting in the death of the cow following calving.
- A high condition score of 4.5-5 for the pregnant cow may result in a difficult birth risking the life of the cow and the calf.



Pig Body condition on a Scale of 1-9

Condition	BCS	Description
Thin	1	Severely emaciated. All ribs and bone structure easily visible and physically weak.
	2	Emaciated, similar to 1 above but not weakened. Little visible muscle tissue.
	3	Very thin, no fat on ribs or brisket, and some muscle still visible. Back easily visible.
Borderline	4	Thin, with ribs easily visible, but shoulders and hindquarters still showing fair muscling. Backbone visible.
Optimum	5	Moderate to thin. Last two or three ribs can be seen. Little evidence of fat in brisket, over ribs or around tailhead.
	6	Good smooth appearance throughout . Some fat deposition in brisket and over tailhead. Ribs covered and back appears rounded.
	7	Very good flesh, brisket full, tailhead sows pockets of fat, and back appears square due to fat. Ribs very smooth.
Fat	8	Obese, back very square, brisket distended, heavy fat pockets around tailhead, and pig has square appearance due to excessive
	9	Rarely seen. Very obese. Description of 8 taken to greater extremes. Heavy deposition of udder fat.

Cattle body condition score (BCS) on a Scale 0-5

BCS	Description
0	Spine prominent transverse processes, feels sharp (Animal appears emaciated).
1	Spine still prominent but transverse processes feels less sharp.
2	Spine more rounded to touch; transverse processes are rounded with a covering of fat.
3	Bone structures only felt with rm pressure.
4	Moderate to thin. Last two or three ribs can be seen. Little evidence of fat in brisket, over ribs or around tailhead.
5	Bone structures cannot be felt and are obviously covered with a thick layer of fat.

Condition Scoring For The Sheep Farmer

The condition score scale for sheep is the same for cows. Targets are set to maximise production from the flock.

- A condition score of 3.5 is the target for mating –a lower score may affect litter size, or result in a barren ewe.
- A condition score of 4-5 at lambing increases the risk of the onset of twin lamb syndrome.
- Before the mating season, the condition score of the ram is also assessed to ensure a high lambing percentage the following year. A condition score of 3.5-4 is ideal for the ram at the start of the mating season. This is because rams lose weight during the season so good body reserves are important to maintain reproductive performance.

9. To demonstrate the various pieces of equipment used on the sheep enterprise at the time of the school visit e.g. (a) iodine dip (b) stomach tube (c) tail removal, etc.

LAMBING

Most lambs are born in February or March and nowadays an increasing number are born indoors. This has the added advantages of shelter and ease of supervision. However hygiene may be a problem, especially for vulnerable newborns. Bedding should be changed frequently to prevent any diseases (e.g. navel ill). Management at lambing is crucial and the following steps should be observed in order to reduce ewe or lamb mortality:

1. Isolate the ewes according to their lambing dates.
2. Keep a close eye out for the signs of lambing (e.g. loss of appetite, production of a water bag etc…)
3. Most ewes will lamb unaided but if there are any difficulties the farmer may have to intervene and deliver the lamb.
4. After the lamb is born, remove any mucus from around the mouth and make sure it's breathing normally.
5. Ensure the lamb drinks plenty of colostrum in the first few hours (200-300ml per feed). This gives energy, minerals, vitamins, antibodies and has a laxative effect.
6. Weak lambs may need to be fed with a stomach tube and hypothermic lambs will need a few hours in a warm box.
7. To prevent navel ill, dip the navel in a 70% iodine solution immediately after birth.

After the lambs are born they are placed in smaller pens for a few days and are then moved outside.

Management: Lambing to slaughter

This article summarises the management of lowland sheep from lambing to slaughter, with particular emphasis on feeding and disease control.

Lamb being fed with Stomach tube

Care of the lambs

After lambing, the ewes and lambs are housed in well-bedded individual pens for a short period of time. It is important to ensure that the ewe and lamb are bonding well, as some ewes reject their lambs. In the first few weeks of life, the lamb's tail is removed for cleanliness and ram lambs are sometimes castrated.

Lambs should only be let out onto pastures if:

- They are sucking well.
- They are well bonded to their mother.
- The weather is not cold or wet; and
- The ewe has an adequate milk supply.

Once the lambs are outdoors, they should be carefully supervised and shelter should be available, especially in the first week.

Care of ewes after lambing

Immediately after lambing, the ewe and lamb are isolated from the rest of the flock. This allows time for her and her newly born lamb to recover. It also makes for ease of supervision. Three to four weeks after lambing, lactating ewes reach their milk production peak and, for this reason, they must be fed adequately. With good quality hay/silage ewes with single lambs should be fed .75kgs of concentrates per day, while those with twin lambs should get twice as much. Concentrates can be reduced as grass becomes available in spring.

Weaning and slaughter

When the lambs reach between 35-40 kg in weight and are in good condition, they are ready for slaughter. Most lambs offered a good diet should reach the target weight at about 3 months old. Any lambs that have not been sold at 14-16 weeks of age are weaned from their mother. These lambs are then fattened and sold later; some may be retained for hogget sales or for breeding purposes.

Sheep conditions

Hypothermia in lambs might be a problem shortly after lambing when the weather is still cold. This can be dealt with by the use of a warm box. On pastures, ewes and lambs should be dosed for worms and then moved to fresh grass to prevent any recurrences. Clostridial diseases (e.g. pulpy kidney) can often kill lambs without warning. If the ewes have not been vaccinated, the lambs should be injected in early spring

10. To explain and demonstrate housing (requirements) for the various livestock enterprises on the farm

HOUSING WELFARE

Five Freedoms for animals

All animals have the right to:

1. Freedom from thirst, hunger and malnutrition
2. Freedom from discomfort
3. Freedom from pain, injury and disease
4. Freedom to express normal behaviour
5. Freedom from fear and distress

Good Housing Welfare is a way of achieving these freedoms

General Housing Welfare

- Housing for animals in Ireland was designed to provide shelter from winter climatic conditions and facilitates provision of an adequate supply of feed and water
- Uneaten or spoilt food should be removed to avoid attracting rodents or other undesirable wildlife
- Surfaces should be designed, constructed and maintained to avoid discomfort, stress or injury to the animals and not be uneven leading to bruising of the feet or be too smooth that slipping occurs
- Housing should contain a sufficient source of natural or artificial light, avoiding discomfort for the animal
- Housing should be well ventilated, allowing for a sufficient supply of air, allowing heat dispersal preventing build-up of gases (e.g. carbon dioxide, ammonia slurry gases)
- Different bedding has advantages and disadvantages
    - Sawdust – not good bedding for wooly sheep as it gets caught in fleeces but works well with haired sheep
    - Wood chips – less absorbent than other materials, but can be used as bedding
    - Shredded paper – more absorbent than straw but more difficult to handle

  No matter what bedding is used, it must be clean and dry

Cattle Housing

Calves can be reared in individual pens but are more commonly reared in groups and allowed an area of 1.1m per calf up to 8 weeks, then this is increased to 1.5m.

- Weanlings usually housed for the first winter in open sheds on straw
- Should be a minimum floor space of 1.4m and 7m air space for each animal with 0.3m feeding space
- Housing for fattening cattle is similar to the housing of weanlings however they need more space - 2m floor space, 10m air space, 0.4m feeding space

SHEEP HOUSING

- For outdoor lambing a field with good shelter and plenty of grass is needed
- Indoor lambing needs an area where some lambing pens can be set up. Lambing pens should be 1.5m x 1.5m
- Should aim to have one pen for every ten ewes in the flock.
- For very compact lambing flocks or the presence of ewes synchronised using sponges, more pens will be needed.
- Location of your lambing pens should allow for easy cleaning out and feeding.

PIG HOUSING

The Farrowing House

- Temperature should be 24°C
- Slatted for waste removal
- Power wash and disinfect between farrowings
- Creep area
- Temperature 30-40°C
- Heated pads for bonhams
- Clean water from water nipples

The Service House

- Temperature 20°C
- Floor area 10m^2

The dry sow and dry sow housing

- For about one month after weaning a litter, and for about two weeks before the sow farrows, dry or pregnant sows may be housed in crates or in groups.
- Temperature 20°C
- Floor Area (m^2)
- Group Housed Sows (≥ 40) 2.025
- Group Housed Sows (>5, <40) 2.25
- Group Housed Sows (<6) 2.475
- Group Housed Served Gilts (≥ 40) 1.48
- Group Housed Served Gilts (>5 <40) 1.64
- Group Housed Served Gilts (<6) 1.81

Dry Sow House

Weaning House

- Stage 1 Weaning (20 kg)
- Temperature 30°C and gradually reduced to 24°C
- Floor area required 2.15 ft
- Stage 2 Weaning (30 kg)
- Temperature 24°C
- Floor area required 3.2 ft

Weaning House

Finishing House

- Temperature 20°C
- Stage 1 finishing
- Floor area required 6.5ft
- Stage 2 finishing
- Floor area required 8ft

11. To examine wool quality in different sheep breeds.

WOOL

Firstly, what is wool? Here are a few definitions.

- The outer coat of sheep, yaks, etc., which consists of short curly hairs (Collins dictionary)
- Wool is the fibre derived from the fur of animals of the Caprinae family, principally sheep, but the hair of certain species of other mammals such as goats and rabbits may also be called wool (wikipedia)

Wool composition

Wool is a protein compound of complex chemical composition. It is highly absorbent and only releases moisture slowly. Wool has two qualities that distinguish it from fur, it has scales which tend to overlap and it is crimped, some fleeces may have as many as 8 bends per cm. Because of the crimp, wool has trapped air in it which also gives it the ability to retain heat.

History of wool production

Wool was probably the first animal fibre to be made into cloth. The art of spinning wool into yarn developed about 4000 B.C. and encouraged trade among the nations in the region of the Mediterranean Sea. The Romans as early as 200 B.C. began to improve their flocks, which became the progenitors of the famed Spanish Merino sheep. The Britons kept sheep and wove wool long before the Roman invasion, but the establishment by the Romans of a factory at Winchester probably improved their methods.

In Ireland the woollen industry was significant with many woollen mills developing throughout the country. Blarney Woollen Mills was originally known as Mahony's Mills and was built in 1824 and provided valuable employment to the people of Blarney and surrounding areas. It produced tweeds and woollens for the home and export markets. In Foxford Co Mayo the woollen mills was founded by the Irish Sister of Charity in 1892 and the town prospered as the mill grew.

Since opening in 1992 the award winning Foxford Woollen Mills Visitor Centre has earned the reputation as a premier visitor attraction in Ireland.

Wool Quality

The quality of wool is determined by the fineness of the fibre. Merino sheep have the finest wool with the Wool: Hair ratio being 25:1 . For most British and Irish breeds the ratio is 8:1. The best quality merino wool is used for worsted and other woollen materials with the next quality being used for tweeds and the poorest quality is used for carpets.

Short wool breeds: Suffolk, Hampshire Down.

Long wool breeds: Border Leicester, Galway, Texel.

Shearing

This is normally carried out in early summer and involves removing the entire fleece of wool using an electric sheers. Sheep are usually shorn on a wooden board that can easily be cleaned to avoid faecal contamination of the fleece.

It is carried out for the following reasons;

- To reduce overhearing of the animal if the summer is warm.
- To reduce the possibility of fly strike (maggots) on the sheep.
- A bulky fleece may decrease the mobility of sheep.

Sheep shearing

Properties of wool:

Wool has many excellent qualities as follows:

1. It is hard wearing and absorbs moisture.
2. It is lightweight and versatile
3. Wool does not wrinkle easily.
4. It is resistant to dirt and wear and tear.
5. It does not burn but smoulders instead.

Uses of wool:

Wool has a range of different uses. For centuries, it has been used in the manufacture of many clothing items. Places like Donegal are synonymous with the production of tweed, which is a form of wool used in suits, jackets and blankets. Poorer quality wool is often used in carpet making. Of late, wool is being used in houses as an insulation material.

Caring for sheep wool

Wool can become infested with many types of ectoparasites (e.g. lice, maggots and ticks). In order to protect sheep from attack, some measures can be taken.

Dipping

This is normally carried out once a year and involves immersing the sheep in a tub of water mixed with an insecticide. However, in recent years dipping is not as widely practised mainly because of the introduction of a less labour intensive pour-on.

Pour-on products

These products are poured over the back and down along the hindquarters of the animal. They are very easy to use and for this reason, they are commonly seen on sheep farms. They are quite effective against many ectoparasites (e.g. greenbottle fly, which causes maggots, the most common summer sheep disease).

Economics of Irish wool production

At one time, wool was a valuable commodity with farmers receiving a good price. However, in recent years, prices have fallen dramatically.

For example, this year wool merchants were paying 60c/kg for wool, giving just €1.50 for the average 2.5kg fleece. With shearers charging €2 to €3 per ewe, farmers are left with potential loss after shearing. Hill sheep farmers are particularly badly hit because there is a lower wool yield from smaller hill sheep breeds. The fall in price is largely due to the introduction of high quality artificial fibres.

Useful websites

www.sheepwoolinsulation.ie

www.sheep101.info/shearing.html

www.suffolksheep.ie

12. To examine the various buildings on an integrated pig unit (if available on the farm)

PIG HOUSING

Proper pig housing is a necessity in modern intensive pig farming.

Why? Housing helps control:

- Low FCR
- Faster Growth rates
- Diseases
- Ease of Management

All the buildings must:

- Be built close together so that an integrated slurry system can be used
- Be well insulated with a low roof as this helps maintain the temperature
- Be ventilated, draught free and hygienic as this helps prevent the build-up of bacteria and disease
- Have adequate space for the animals as this helps prevent stress and disease
- Have feeding troughs and water available

TYPES OF HOUSES

Dry Sow House

A dry sow house contains the dry sows and some boars. The boars are present to encourage the sows to come back into heat. As can be seen from the picture of the dry sow house, the sows are housed in individual pens (1.5m x 0.7m). The temperature is maintained at 20˚C and the feeding system is automated (note the feeding pipes coming from the roof). One week before farrowing, the sow is moved from the dry sow house to the farrowing house.

Farrowing House

When the sow is moved to the farrowing house she is washed, deloused and disinfected. She is also vaccinated and put into a farrowing crate. The farrowing crate allows the sow to farrow without causing risk to the bonhams and it allows the bonhams easy access to the sow for suckling. The temperature of the house is 20˚C. There is an infa red lamp in the farrowing unit for the bonhams and the temperature under the Infa red lamp varies. When the bonhams are born, it is approximately 29˚C and will be lowered to 24˚C over 5 to 6 weeks when they are weaned from the sow. At this stage, the bonhams are moved to the weaner house.

Farrowing House

Weaner House (9kg – 32kg)

Weaners of similar weight are selected and stocked at sufficiently high density to allow house temperature to be maintained at 24˚C. Houses have very good insulation and low roofs to conserve heat. The floors consist of an iron grate which allows collection of the slurry. Again feeding is automated. As the weaners increase in size they are regrouped so that the houses do not become overcrowded. When weaners reach 32kg they are moved to the fattening house.

Fattener House

The Fattener House is similar in design to the weaner house. Fatteners are arranged into groups of equal sized pigs and are stocked at a density to allow the temperature to be maintained at 22˚C.

Feeding is automated. Fatteners remain here until they are ready for slaughter at approximately 80kg or when they have the degree of "finish" required by the factory.

PIG DISEASES

Lameness

Lameness is a common cause for culling sows second only to reproductive failure.
Cases can occur at any time during the dry period or in lactation.

Symptoms:

- The pig goes off its food
- It's reluctant to stand
- It doesn't accept boar at mating

Causes / Contributing factors:

- Cuts or breaks in the skin
- Fighting
- Fractures
- Poor floor surfaces

Treatment:

• Early identification of lame animals and their removal to pens for treatment is a vital part of the control and healing process.

Joint ill in Piglets

Joint ill results from an infection which gains entry to the blood stream at or soon after birth, circulating around the body and then settling out in the joints.

Causes:

The cause of joint ill is bacterial infection of the piglet. There are a number of possible routes by which the bacteria can gain access to the blood stream and, hence, spread to the joints. These include through the navel, badly clipped teeth, contamination of a docked tail stump or wounds

Symptoms:

Symptoms include a piglet carrying a leg or reluctant to stand. It is often the case that visible swelling of specific joints occurs later.

Treatment:

Early individual antimicrobial treatment is essential if a recovery is to be made.

Prevention:

The key to controlling joint ill is firstly, to improve hygiene in the farrowing area and secondly, to identify and rectify the route of entry of infection i.e. when cutting navel, clipping teeth and docking the tail.

Anaemia

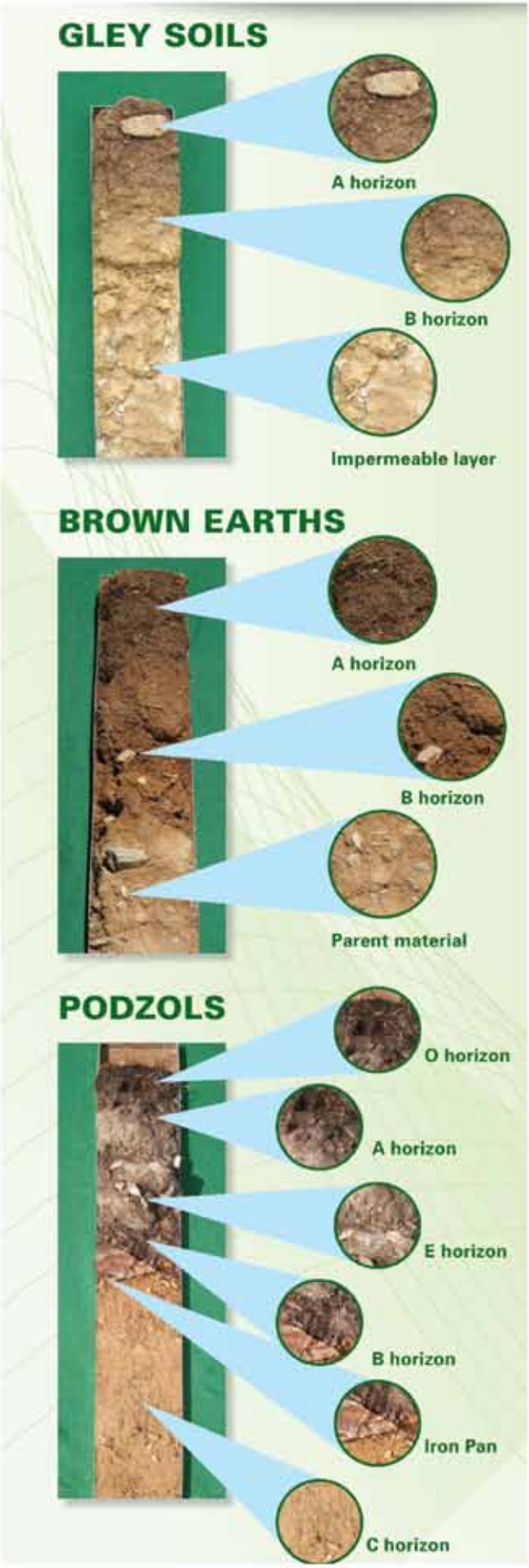
Anaemia is caused by the lack of sufficient, or diseased red cells in the blood. This is mainly a disease of the bonham because it is born with limited supplies of iron, a vital component in blood cells. If the bonham does not have access to iron in the first 2 - 3 weeks, it's red cell capacity to absorb oxygen (anaemia) is impaired. Anaemic animals will be susceptible to infertility.

Symptoms:

- Pale skin
- Rapid breathing
- Jaundiced sometimes (Skin slight yellow appearance)
- Scour

Prevention:

All bonhams given an injection of iron in the first week of life.



Grazing

Milking - Herringbone Parlour

Friesian cows (widely considered the best milking cow)

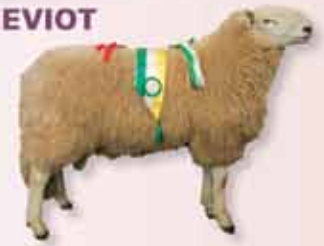
AGRI AWARE

Agri Aware brings you Sheep and Pig Breeds

UPLAND BREEDS

WICKLOW CHEVIOT

CHARACTERISTICS
- Medium size & bodyweight
- Good quality wool
- Good mothers
- Mainly single lambs
- Suited to more fertile hills



www.wicklowsheep.ie

BLACKFACE MOUNTAIN
(Scottish Blackface)

CHARACTERISTICS
- Low size & bodyweight
- Very hardy
- Very good mothers
- Mostly single lambs
- wool only suited to carpet making

UPLAND BREEDS are adapted to life on sparce grazing on hills and mountains.

LOWLAND BREEDS

GALWAY

CHARACTERISTICS
- Maternal Breed
- Very large size & bodyweight
- Very good wool production
- Mainly single lambs
- Late maturing & late finishing
- Bred in east Galway & Roscommon

BELCLARE

CHARACTERISTICS
- Maternal Breed
- Medium size
- New breed developed near Tuam, Co. Galway in 1960's
- Early maturing
- Mainly twin lambs
- Bred to cross with Galway sheep to improve production

BORDER LEICESTER

CHARACTERISTICS
- Maternal Breed
- Medium/large size
- Mostly twin lambs
- Good milk production
- Medium / late maturing
- Very good mothers

www.belclaresheep.com

SUFFOLK

CHARACTERISTICS
- Conformation Breed
- Medium size
- Early maturing & finishing
- Good body shape (conformation)
- Good wool production
- Moderate number of twins

www.suffolksheep.ie

TEXEL

CHARACTERISTICS
- Conformation Breed
- Medium size
- Early maturing & finishing
- Very good body shape (conformation)
- Produces leaner meat
- Moderate number of twins

LOWLAND BREEDS have adapted to produce high quantities of meat and wool from fertile lowland grass.

OTHER SHEEP BREEDS

Jacob, Oxford Down, Dorset Horn, Charolais, Rouge de L'Ouest

INDOOR PIG BREEDS

LARGE WHITE

CHARACTERISTICS
- An English breed
- Large litter size of 12-16
- Good mothers
- Short deep body
- Erect ears

LANDRACE

CHARACTERISTICS
- A Danish breed
- Very long body
- Early maturing
- Good conformation
- Floppy ears

DUROC

CHARACTERISTICS
- An American breed
- Also suitable for outdoor production
- Crossed with Large White and Landrace to maximise Hybrid Vigour

OTHER PIG BREEDS

Wessex, Saddleback, Tamworth (All Outdoor)

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Agri Aware, Waverley Office Park, Old Naas Road, Dublin 12. Visit www.agriaware.ie or contact 01-4601103