Penning, sewage, sullage, sludge and poudrette. Concentrated organic manures – oil cakes, blood meal, bone meal, horn meal, fish meal, meat meal & Guano

Penning

Keeping the boven animals (cattle and sheep) in the fallow land after the harvest of the last crop, throughout day /and or night provided with suitable food and shelter.

Types of penning: There are two types of penning

I. Cattle penning

II. Sheep penning

I. Cattle penning:

Keeping the cattle in the fallow land after harvest of the last crop, throughout day and night by providing them suitable food and shelter is called cattle penning. It is an ideal practice of collection and storage of dung and urine directly in the field. Urine is absorbed by soil while dung and litter are incorporated in situ. Losses in storage and collection are avoided by penning. Cattle are shifted from one field to other field once in 2-3 days for covering the maximum area. The dung and urine are uniformly spread and ploughed in it. The period congenial for cattle penning varies from 3-6 months i.e., form January –June or March to May depending on the extent of non cropping period.

Cattle penning is largely done for seedbeds of rice, root crops, sugarcane, vegetable etc., which require very heavy manuring. It is one of the oldest practice followed in India .About 800-1000 cattle per acre are penned which would be equivalent to 10-15 tonnes of cattle manure per acre [Composition (%): 0.5 N, 0.25P and 0.5K].

II. Sheep penning:

It is a popular practice followed in drier regions of Andhra Pradesh. Flocks of sheep and goats are penned in the fields during nights and allowed to graze during day time. The flocks are frequently disturbed during nights to increase droppings as they tend to void droppings when disturbed. The sheep penning is generally adopted for cash crops like vegetables, tuber crops, chillies and sugarcane.

Penning about 2000 heads per acre is the common practice. Sheep and goat manure are relatively lower in moisture content and higher in nutrient value than cattle manure. Average nutrient composition (%) of sheep and goat manure 1.93 N, 0.6 P and 1.90 K.

Some of the other organic (bulky) manures are obtained from the solid excretions from piggery, poultry and Human excreta (Night soil).

I. Pig manure: It is collected in dry state stored and extensively used whenever it is available for rice, banana, and vegetables. The percent nutrient composition is 3.7 N, 1.4 P and 0.3 K.

S.No.	Nutrients	Human excreta nutrients supply (kg/person /year)	Relative values in terms of cattle dung(kg /cow /year)
1	N	4.7	2.9
2	P2 O5	1.1	0.8
3	K_2 O	1.0	2.3

II. Poultry manure: It has been become popular consequent to the rapid growth of poultry industry. It is used for extensive cropping such as rice, sugarcane and chillies. The per cent nutrient composition of poultry manure is 0.9 N, 0.8 P and 0.5K.

Night soil: Human excrements both of solid and liquid material put together constitute Night soil. It is a rich source of N and P than cattle dung.

POUDRETTE

It is the product obtained from night soil without any admixture of other organic waste materials. Night soil is spread in thin layers over which copper sulphate and soil are lightly spread. The mass is periodically racked up and re-spread till dry. It is called poudrette. When it is properly prepared looks like a reddish loamy soil and in dry, powdery and devoid of offensive smell.

Night soil digestion: CPHERI (Central Public Health and Engineering Research Institute), Nagpur is working on night soil digestion, it provides

1. In offensive sludge with undiminished fertilizer value
2. Gas and electricity for rural areas

Night soil can be digested in a 230 sq .feet (6.5m3) digester without any fly or odour nuisance in an unheated open tank with manual stirring.

Design criteria for night soil digester

A. Capacity : 3-6 m^3

B. Raw night soil: water : 2:3

C. Gas yield : 3 m^3 /100 persons

D. Calorific value : 5558 K.Cal/ m^3 gas

E. Horse power generated for 100 persons : 2.0

F. Manurial value on dry basis (%) : 3-5 N, 2 to 4.4 P_2O_5 and 0.7 to 1.9 K_2O

The sludge in the night soil digester is removed in a week or two. The sludge can be spread on a drying bed of 3-5m^3 /100 persons where it can dry and be removed for use as manure.

The composition of gas (%): 65 CH_4, 34 CO_2 and 1 others on volume basis. Gas is used for running pump sets and street light lamps.

The supernatant liquid from the digester is mixed with garbage and compost and used as manure.

Sewage and Sludge

Sewage:

Sewage refers to the used up water from towns and cities collected though a drainage system. It consists of solid and liquid excreta and liquid wastes from kitchen and bath rooms. It also contains animal vegetable and mineral matter in suspension, solution and colloidal state. It is the mineral matter that makes the purification difficult.

Sewerage: Sewerage is the pipe system that carries the sewage for disposal

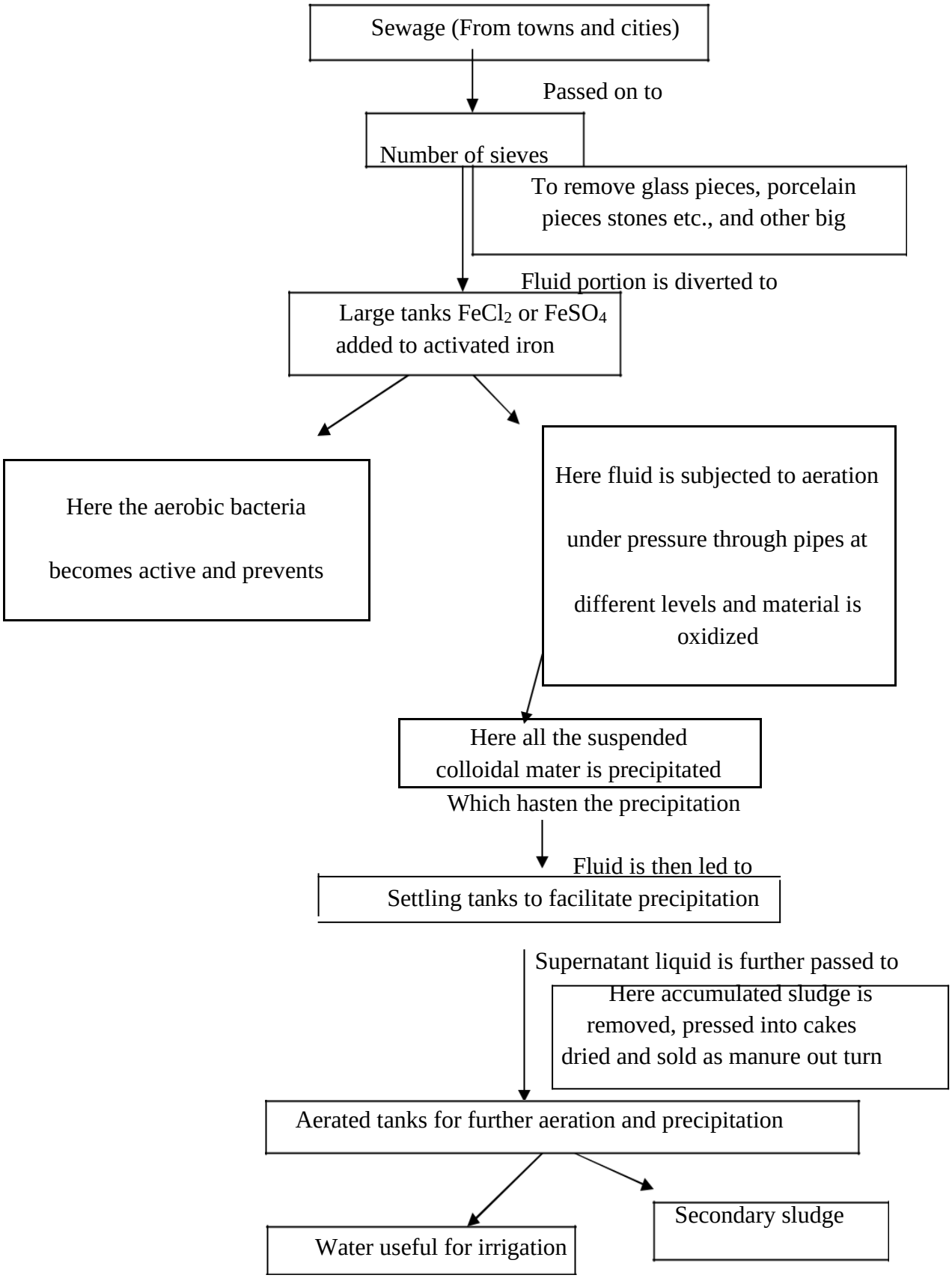
Sullage: Is the water drained from the kitchens, bathrooms and drainage water of the streets (open canal)

Effluent: It is the clear supernatant liquid obtained after aeration during sedimentation process in the septic tanks of the activated sludge process. It is fit for irrigation and rich in N.

Sludge: Sludge is he sediment that settles down in the activated sludge process .It is dark and powdery material with good manurial value.

Activated Sludge Process

In this process, the sewage is diverted outside the town or city and processed. There is specially constructed plant consisting of series of tanks fitted with pipes at different levels and the compressors to pump air under pressure. The following is a flow diagram for activated sludge process.



Out turn of the sludge is 15 per cent of entire sludge handled. Manurial value is 3.5% N-1.0% P_2O_5 - 0.5 to 1.0 % K_2O.

Advantages:

1. Maintain proper sanitary conditions
2. Large quantities of manure and water useful for irrigation
3. Generates good income to the local bodies
4. Avoids pollution of adjoining rivers and seas.

B. CONCENTRATED ORGANIC MANURES

I. Bone Meal:

Bone meal is a white to whitish material produced by treating the bones obtained in abattoirs (Slaughter houses). The bones are dried, crushed, degreased and cleaned to obtain bone grist. Finely ground, it serves as an organic N- P fertilizer.

Deamination: It is a process of removal of proteins from the grist which yields deaminated bone meal**.** It is also referred as steamed bone meal.

Bone meal is a P-fertilizer of organic origin i.e., it contains $Ca_3 (PO_4)_2$. It has 1.0 to 2.0 per cent N and 10-13 per cent P .In general young bones contain less P and more nitrogen than older bones.

Bone meal has some residual effect. Rice and other cereals and other orchard crops respond well to its application. It is particularly useful for soils high in Fe and Al content and applied along green manures with advantage prior to sowing or planting. It can be used for crops rather indiscriminately without fear of salt damage (burning) unlike chemical fertilizers.

II. Horn Meal:

Horn powder, horn grist or horn chips can be obtained depending on the degree of crushing and collectively termed as horn meal. This is a slow acting fertilizer of Nitrogen containing 14 per cent N.

About 3-4 kg horn and hoof material can be obtained from each animal. Horn and hoof meal manufactured in India annually to the extent of 14,000 tones provided horns and hoofs of all the dead animals are collected and processed.

Horn and bone meal mixed fertilizers yield organic N-P depending on their composition (N from Horns and P from Bones).

III. Blood Meal/ Blood Powder:

Blood is collected from abattoirs (slaughter houses) dried and ground. Two types of dried blood are manufactured.

Red product: It is obtained by drying the blood with super heated steam and hot air.

Black product: It is obtained by evaporating the liquid blood over sand bath subjected to higher temperatures. It is evenly causes the loss of N and causes Charring.

Both red and black products are spread on the concrete floor covered with a net and allowed to sundry. This powder is used as manure.

Characteristics:

1) Blood meal absorbs moisture on exposure to atmosphere
2) Of all the protein organic manures, dried blood has the highest availability of N and given a rating of 80 (i.e.,) it is 80 per cent as efficient as the inorganic N fertilizer in providing the nitrogen to the crop.
3) An adult bovine (cow, buffalo /ox**)** gives 15 kg where as sheep or goat yields 1.5 kg of dried blood.
4) About 30-40 kg of dried blood is obtained from 100 kg fresh blood.
5) The principal component of blood is N .Which is 10-14 % in slow acting form.

IV. Meat Meal:

It is also referred as TANKAGE obtained from rejected carcasses (meat products) mostly meat and waste products such as leather scrap, feather, wool etc. These materials are cooked in steel tanks under pressure of 2 to 7 kg / cm^2 for 30-90 minutes. Addition of sulphuric acid (0.5%) facilitates hydrolysis at low temperature. It is dark brown and fluffy material. It contains 7 %N, 1 to 5 % P and 3 to 10 % K. Tank age has the rating of 60 per cent.

V. Fish Meal:

The non-edible fish, fish carcasses and offels (parts of butchered animal) are used to prepare fish meal .Such material are crushed or powdered after drying .The oil is generally removed before the meal is ground and facilitate easy decomposition .It is quick acting fertilizer suitable for all crops on all soils. It contains 7 to 8% N, 2 to 3 % P_2O_5 -and 0.2 to 0.5 % K_2O.

VI. Guano:

The name Guano is originated in PERU, from the word “HAUNO” to mean manure. GUANO is a product of sea bird (Pelican, Gannets, and Albatrosses) excrement covered over long periods and occurring in natural deposits. These birds live on islands with no rain or vegetation along with the pacific ocean coasts of PERU and CHILE and feed on abundant fish in the sea. These deposits may also have the excrements of turtles and seals together with the remains of dead bodies of birds ,bone, feather, sand and gravel etc., guano deposits are up to 60 meters thick ,however only central layer has a higher N-content . Guano has a colour

varying from grey to dark brown, physical characters vary with the age, nature of deposit and amount of foreign material. It contains 8 to 15 % N and 2 to 3 % P. The chemical constituents are mainly ammonium oxalate and ammonium phosphate as well as calcium phosphates. There are important admixtures besides 2-4 % K.

Raw guano is some times processed into guano fertilizer by acid decomposition with sulphuric acid. This is called peru guano: 6+12+2 (N+ P_2O_5+ K_2O). Guano also occurs elsewhere as "cane fertilizer" produced by bats.

VII. Oil Cakes:

After removal of oil from seeds, the residue is made in to cakes. Oil cakes are used as organic fertilizers as they are rich source of organic nitrogen in protein form. In addition to N, small amounts of P, K and micronutrients. Oil cakes are classified into two groups viz.,

Edible oil cakes: Suitable for cattle and poultry feeding and also as a manure /fertilizer but not economical Eg. Groundnut, Gingelly cakes etc.,

Non –Edible oil cakes: Suitable for crop fertilization. Eg. Castor cake, neem cake etc.,

Edible oil cakes serve as fertilizers, but their use is restricted due to economic reasons .Composition of oil cakes are variable. Oil cakes are quick acting organic manures .The decomposability increases with decrease in oil content. They nitrify in about 30-45 days on addition to the soil. The rate of decomposition can be hastened by grinding the oil cakes into fine powder and thorough mixing with the soil.

1) Castor cake:

It is also called as castor pomace. It is the ground residue of beans from which oil has been extracted .it is poisonous to animals and used only as fertilizer. it is a by-product in the manufacture of castor oil. It contains 5 to 6 % N, 1 % P_2O_5 and 1.0 % K_2O . It has got a rating of 75 per cent.

2) Neem cake:

Neem cake is prepared by crushing the neem seed (with shells) in expellers and oil is separated. Neem tree is regarded as a "village dispensary" by virtue of its medicinal and antiseptic value. Neem cake is useful for cash crops mainly due to insect repellant or insecticidal properties owing to the presence of residual bitter and sulphur. Comparatively it contains higher N. It cannot be used as a cattle feed due to its bitter taste.

Chemical composition of neem cake

S.No.	Constituent	Content (%)
1	Organic matter	84.5
2	Moisture	9.9
3	Carbohydrates	17.5
4	Protein	36.2
5	Fiber	11.7
6	Oil	18.2
7	Ash	6.8
8	N	5.8
9	P	0.46
10	K	1.12

Neem cake has also been used as coating material over urea super granules as the former is reported to improve the fertilizer efficiency of soil applied urea.