

POULTRY PRODUCTION AND MANAGEMENT- **THEORY(PART 1)**

B.Sc.(Ag.) 2nd Semester

Prepared by: Dr. Kamlesh Singh(Asso. Professor)

Deptt. Of AH & Dairying K.A.P.G. Prayagraj

Lecture 1: Classification of poultry viz. layer, broiler and dual purpose- Nomenclature of commercial layer and broiler strains.

India occupy 5th place in worlds Egg production -32700 million. The per capita consumption of an India is approximately 33 eggs as against the recommendation of 180 egg.

Indian poultry population – 435 million – 4% World poultry.

The poultry production through out the world is carried out by a highly specialized efficient Poultry Industry that has been a leader in trends of scale. Poultry Industry has shifted itself rapidly and completely from a small scale non intensive production units to a highly specialized intensive industry. The progress is attributed to the conceptual change that had taken place in the middle of the century.

Which is attributable to the demands of the situation

Shortage of red meat,

Lesser cost and land involvement

Shorter generation interval

Higher multiplication rate.

The following are the reasons for the phenomenal development of the Industry.

1. Evolution of High yielding strains
2. Economic management systems.
3. Improved Nutritional systems.
4. Advanced Desired control technology.
5. Automation in operation.
6. Integration
7. Increased consumer awareness.
8. Improved marketing system.
9. Insurance and Bank Assistance.

Poultry Industry:

Grand parent Hatchery

Parent Hatchery Sub-Franchisers

Grower farms

Feed manufacturers

Equipment manufacturers

Marketing enterprise.

disease control units and poultry service organisation.

Breed of poultry

Class : Many groups of birds belonging to a particulars tract or locality Eg. English, Asiatic, American.

Breed refers to a group of domestic fowls with a common ancestry and having similarity in shape, conformation, growth, temperament, shell colour of egg and breed true to type. Variety is a subdivision of breed and within a breed there may be several varieties. The term variety is used to distinguish fowls having the characteristics of the breed to which they belong but differing in plumage colour, comb type etc. from other groups of the same breed. A breed/variety may also have several strains or lines identified by a given name and produced by a breeder through at least 5 generations of closed flock breeding for a particular purpose. Several strains within a breed/variety phenotypically may look alike but often differ in their production performance depending upon their breeding history.

Breed of Poultry

Asiatic

American

English

Mediterranean

Aseel

Plymouth Rock

Sussex

Leghorn

Karaknath

Wyandotte

Orpington

Minorca

Ghagus

Rhode Island Red

Australorp

Ancona

Chittagong

New Hampshire

Cornish

Spanish

Mini

Andalusian

Brown Desi

Denki

Naked neck

Brahma

Cochin

Langshan

Poultry may also be classify based on were utility

1. Layer – Leghorn, Minorca

2. Broiler – Orpington, Cornish

3. Dual – Plymouth, Rhode island red

Based on the utility and perfomance many hybrid strains of poultry have been developed and commercially produced.

Layer – Babcock 300, Hyline-WS 36, Bovans.

Broiler – Ross, vencobb, hybro.

Egg Science and Technology :

Egg is the physiological product of the female reproductive system and a hen's egg, apart from the ovum does contain other nutrients for the growth and development of the embryo.

Egg average weight : 50-60 gm.

Egg contains yolk – 30%

White or albumen – 58%

Inner & outer shell membranes & shell – 12%

Nutrient composition : on egg weight

12% Protein

11% Fat

12% minerals and 65 % water

Calories : 148 cal/100 gm.

grading of eggs :

By wt. : Extra large 60 gms/egg

Large 53-59 g.

Medium 45-52 g.

Small 38-44 g.

Agmark grading :

A- grade : Clean, unbroken shell, aircell, 4mm depth, clear, firm white well centered yolk free from defects.

B-grade : Clean, moderately tainted shell, aircell 8 mm depth, slightly off centered and shape visible

No grade : Eggs classified as loss or no grade is edible - contaminated by smoke, chemical and other foreign materials, which may effect the character and appearance.

Lecture 2: Care and management of day old chicks-Brooder management.

Preparation of Brooder

Brooder means to give a heat source by artificial means for the period of growth of chicks from 0 day (Day old) to 4 weeks. The heat source generally has a large reflector (Hover) under which the chicks will get the heat uniformly.

Aim

The day old chicks do not possess the insulating feather coverage to protect them from cold. It may result in the losing of body heat to the environment resulting in chilling which will create the ground for many diseases.

Preparation of Brooder and daily routine work carried out in the farm

Objective

Chicks do not possess a well-developed thermo- regulatory mechanism. The day old chicks don't possess the insulating feather coverage to protect them from chillness. The body temperature of chick is 107°F which is always more than the ambient temperature. It may result in the losing of body heat to the environment. So a source of heat is given by natural brooding or by Artificial brooding up to 4 weeks of age.

Materials required

Hover or wooden cross bar. Automatic brooder, fuel heaters like lantern.

1. Bulbs
2. Chick guard

3. Thermometer (0 to 110°F)
4. Waterer
5. Linear feeder,
6. Lime powder
7. Lysol
8. Sprayer
9. Coirpith, GN husk or paddy husk
10. Waste news paper
11. Flame gun
12. Automatic vaccinators .
13. Debeaker
14. Bucket
15. Broomstick
16. Rake
17. Electrolyte
18. B Complex and Vitamin A
19. Antibiotics
20. Lasota F₁ Vaccine
21. IBD Live vaccine

Preparation of Brooder House

1. The litter material of the previous batch should be heaped up first so that building up of germs could be destroyed.
2. After 2 to 3 days the heaped up material can be removed from the brooder room.
3. The portion of the litter sticking over the ground must be scraped and removed.
4. The removal of spider web, cob webs and dirt are also essential.
5. The floor and sidewalls should be washed with plain water.
6. Disinfection of the room is carried out by spraying phenyl, lysol, etc at 5% concentration.
7. Use Flame gun to destroy the insects.
8. The entire floor and side walls should be white washed with fresh limestone.
9. Feeders, waterers, , chick guards should be washed and disinfected in phenyl or lysol. Dry it in the sun for a day.
10. Hang the gunny bags around the brooder house to maintain the room temperature to maintain temperature not below 80°F in the first week 75°F in the 2nd week 70°F III week, 65°F -IV week.

Chick guard

Hover

Feeder

Waterer

Liter material and paper

Decide on the no. of brooders depending on the number of chicks ordered

1. Connect the chick guards in circular fashion with diameter of 5 feet to accommodate 150-200 chicks.
2. Spread the litter material like coirpith, or paddy husk or ground nut husk on the prepared floor to a depth 2 inches.
3. The litter material is to be covered with newspaper.

4. The feeders and waterers are to be arranged in a radiating fashion from the light source.
5. 4 hours before the scheduled arrival of chicks place the waterers with water in order to bring water to room temperature.
6. The brooding unit should be kept ready at least a day before the arrival of chicks.
7. The brooding bulb must be switched on atleast 24 hours earlier to make the area warm at the time of housing the chick.
8. Depending on weather condition put curtains on all four sides of room to maintain room temperature.

Brooder Management

1. Spread finally grained maize over the news paper before the arrival of chicks.
2. Give cool water after boiling. Add electrolytes, B Complex and antibiotics.
3. Distribute chicks equally after counting under the brooders.
4. Before putting chicks under the brooder scale their beaks with water.
5. For first 3 days provide crushed maize twice a day. Also provide ground maize in the feeder.
6. Change newspaper sheets immediately if they get wet.
7. Remove newspapers on 5th day.
8. Remove wet litter under waterers immediately and add fresh liter.
9. On fifth day give Lasota F₁ Vaccine.
10. According to the age of the birds brooder temperature should be adjusted.
11. Medication and vaccination
 - a) 1st day give 5% glucose in water.
 - b) 2nd to 4th day - antibiotic + Vit.A + B Complex.
 - c) 5th day - RDVF vaccination
 - d) 10th day - IBD vaccination.
12. Daily morning and evening wash the waterer and give freshly boiled and cooled water.
- 13.
- 14.
- Give 24 hrs. light up to 3 weeks to induce night feeding.
- Debeaking is done at 2nd week to prevent cannibalism and feed wastage.
15. Chick mash should contain 22% protein and 2800 kcal/kg ME

Observation

Watch the chicks under light, if chicks are spread uniformly under the light and brooder area, then the temperature maintained is correct. If the chicks are huddled under the light, heat provided is not enough.. If the chicks are away from the light source, the heat intensity is high. Give enough space for watering and feeding for growing chicks according to the age of the birds.

Brooder management : Zero –8 weeks

Chick hood is the most critical age in birds life as it readily picks up problems due to chilling, mal - nutrition, over crowding and diseases.

Productivity of a layer or a broiler depends largely on the way how they start their life.

New born chicks require warmth to keep them in comfort. Hence they are provided with artificial heat by a device called brooder.

Brooder can be hover type, flat, type, wooden reapers fitted with bulbs or heating bulbs or infra red bulbs

Brooding Temperature : 95°C I week

90°C II week

85°C III week

80°C IV week

Floor space : ¼ sq.ft./bird 0-3 weeks

½ sq.ft./bird 4-8 weeks

Feeder space

0-3 weeks 1”

4-8 weeks 2”

Water space

0-3 week ½”

3-8 weeks 1”

Arranging for brooding

Spread litter on a prepared floor, over which place old news paper arrange the heating device in the middle. Cover the desired area with chick guards. Keep waterers and feeders, radiating from the heat source.

Conserve heat by blocking the side-mesh with gunny sacks.

Medications

I day glucose- 5% in water

II to 7th day – antibiotic + Vit.A + B Complex

III week & VI week coccidiostats in water.

Always use boiled and cooled water for 1st three weeks.

Then sanitize the water for the rearing period

Vaccination : Mareks, Ranikhet and Fowl pox.

After 3 weeks continuous or 23 hours light period has to be given to the chicks to induce night feeding and avoid trampling. Debeaking is done at II week to prevent cannibalism and feed wastage – Feed used in chick mash. Contains 22% crude protein and 2800 kcal/kg ME.

Grower management

8 - 20 weeks. – floor space : 1-1 ½ Sq.ft. feeder space – 3” water space : 1½-2” feed – Grower mash

Restricted feeding

To keep the birds in normal desirable wt. range -10% to 20% of the feed required by the bird is restricted from 10-18 week of age.

Lighting : Grower should not be provided with extra light except day light to counteract undesirable effect on sexual maturity.

Deworming :

Debeaking, delimiting if necessary – are to be carried out before the onset of lay.

Lecture 3: Systems of housing- Deep litter and cage systems – merits and demerits.

System of poultry rearing :

In the annals of Poultry Development, one can see a gradual development in respect of the allotment of space, feeding, nutrition and in management etc. on the basis of scientific and technological developments poultry management moved from free range system to semi intensive system and then to intensive system.

Free range system:

Birds are allowed free range, such that it can wander at will, over the allotted paddock or field and are not controlled by fences.

Deforested land was used. 200 birds/acre allotted. In an ordinary land 100 birds/Acre was allotted. They received their bulk quantity of feed from the land in the form of herbage, seeds, insects etc. besides in small quantity by hand feeding. A small housing is provided for night shelter.

Advantages :

1. Maintenance on clean ground decrease the risk of disease.
2. Reduction in cost of management.
3. Birds get good amount of feed from the land
4. Cost of housing is less.
5. Soil fertility is maintained
6. Farming operation is not interfered with

Disadvantages

1. Losses are serious where predatory animals are abundant
2. Wild birds may consume much feed and they transmit disease.
3. Eggs may be lost when laid in hedge rows.
4. Impossible for adoption unless ample land is available.

Semi Intensive systems :

Birds are provided with a pen and run. Pen is an enclosed house and run is an enclosed grass area with fence.

As few as six to as many as 200 can be kept in are acre of land in this system.

3 to 4 sq.ft / bird in the pen.

Floor level should be at least 10” from the ground level

Advantages:

- 1.Complete control over operation
- 2.Useful for record purposes
- 3.Operational throughout the year
- 4.Economic use of land (free range)
- 5.Better protection during winter

Disadvantages

- 1.High cost in fencing
- 2.Danger of over stocking

Intensive system

- 1.Deep litter system
- 2.Cage system

The concept of deep litter system

Birds are raised within four walls, over litter material which is of organic in nature capable of absorbing moisture and releasing moisture to the atmosphere and also to serve as a bedding material for the birds.

Coirpith

Paddy husk

Ground Nut

Saw dust

Wood shavings

straw chopping

paper straw chopping

sugarcane baggase

When moisture is absorbed there will be controlled microbial activity and odour will also be minimum.

Vit. B12 and B2 are available

depth four inches at beginning. 6-8" – later

Qualities of good liter material

1. It should readily absorb moisture
2. Should not cause injury to birds.
3. Moisture level should be less than 15%
4. Should get decomposed and form good manure.
5. Should spread evenly
6. Should be non-toxic.
7. Should not cause dust pollution.

Advantages:

1. Land requirement is minimum
2. Easy and economic management
3. Scientific feeding and management
4. High degree of supervision.
5. Minimum Labour.
6. Automation is possible.
7. Manural value is increased.

Disadvantages

If the management is bad, liberation and accumulation of ammonia, wet litter problem dirty eggs, disease problems may result.

Cage system : Battery cages.

Very popular, called as Californian cage system. Birds are kept under total confinement with minimum space feed and water provided from outside. Eggs laid will get rolled out by the inclined floor bottom.

Types of cages

1. Single
 2. multiples
- colony cages 20-30

Advantages :

1. Vertical expansion
2. Easy feeding and management.
3. Protection from Vermin and wild birds.
4. Litter borne disease are avoided
5. Spreading of disease minimum
6. Minimum area is required / bird.

Single 1 /sq.ft.

Multiple – 0.75 sq.ft.

colony – 0.5 sq.ft.

7. Cleaner eggs.
8. Research data collection easier
9. Identification of birds, handling and culling of non layers easier.
10. Insects and pests controlled
11. Vices are kept at minimum

12. Birds are of softer flesh than the floor reared birds.

Dis-advantages.

1. High cost of installation
2. Breeding is not possible unless Artificial Insemination is practiced.
3. Cage layer fatigue or paralysis is a problem if not attended to.

Housing management

Poultry should be provided with a good housing which will facilitate 1. shelter 2. Protection from wild animals 3. Bad weather condition. Ideal housing helps the birds to perform well. To establish a viable poultry enterprise capital, land, labour and technical know how are essential.

The housing design should be flexible and it depends on

1. Age and stage of the birds.
 2. Functional requirement.
 3. The climate and environment.
 4. For efficient supervision
 5. Minimum structures to have efficiency.
 6. Economy in construction.
- Selection of site and construction of houses.

1. Hard soil type
2. elevated area should be selected for house construction
3. Cheaper in cost.
4. should have continuous water supply - good and wholesome.
5. Should be away from the urban area and also should be at an easy reach.
6. should have good road/rail facilities for transport.
7. should be easily accessible for supervisor
8. should have good ventilation
9. There should be freely available space for expansion.
10. Marketing- preferential
11. Management of brooder cum grower, layers, breeders should be specified in distinct areas to avoid crisscross movement of birds and inter current infection - such segments should be 100 feet away from each other.
12. Building should be constructed in east-west direction that is long axis should lie in east-west direction
13. Width of the building should be restricted to 30 feet and the length can be extended to the requirement. Height 10-12 feet.
14. North and South sides of the building should be fitted with wiremesh to permit airflow.
15. Roofs can be -thatch, Tiles, asbestos, light roofing or zinc sheet.
16. there should be minimum structures so that there could be good air movement
17. Manure pit and the incineration room should be constructed at the far end in leeward direction.
18. Farm house should be located at the entrance to minimize the movement of visitors into the deeper areas.
19. Agriculture operations can be combined with poultry farming.

Desing of poultry houses.

Shed – lean to roof

Gable

Half Monitor

Full Monitor

Flat roof houses.

kinds of poultry houses.

1. Brooder house.
2. Brooder cum grower house
3. Layer House
4. Breeder House
5. Broiler House
6. Cage House

Layer

Broiler

Comfort Zone

10-24°C

21-25°C Temperature

Optimum

13-20°C

24°C

Acceptable

50-75%

50-75%

Humidity

Preferable

60% 60%

Lecture 4: RAISED PLATFORM HOUSING-FLOOR SPACE REQUIREMENT-LITTER MANAGEMENT

Latest developments in Housing and management of commercial Layer Farms.

New concepts in poultry house design and farm management are finding their way for improved flock performance through better environmental conditions and automation in feeding, drinking and related systems. All this ensures more comfort to birds leading to better production and higher profitability. Among the recent innovations which have been successfully adopted in the country including construction of elevated platform cage and environmentally controlled houses with automatic drinking and feeding systems for rearing layer birds. This integrated and latest approach to housing design, nutrition, management and disease control would eventually influence flock performance and profitability.

ALTERNATIVE HOUSING SYSTEM

TRADITIONAL FREE RANGE

In the past, free range was a general description indicating only that poultry was allowed to range over the fields. Today, free range is specific term and flocks were described as much meet the criteria listed below.

1. Birds should have continuous access to open runs and the ground to which they have access must be mainly covered with vegetation.
2. The entire area should be well fenced to keep out the predators.
3. Stocking density should be not greater than 1000 birds / ha. of available ground (1 hen / 10 m²)
4. A very high degree of management is required.

Semi-intensive –Modified free Range :

For these systems , as for free range with exception that the maximum outdoor stocking density should not be greater than 4000 hens / ha.of land available (1 hen / 2.5 m²)

DEEP LITTER

An egg producer who wants to market eggs with label “deep litter” must fulfil the following conditions. The maximum stocking density may not be less than 7 hens / m² of available floor space (1400 cm² / bird)with at least one third of this area are being covered with litter material. A sufficient large part of the floor area should be available for the collection of droppings.

MODIFIED CAGES:

These cages offer the hen a more complex environment while retaining the advantages of small colony size, hygiene and economics of battery system. Birds area specifications are identical to battery cages. At least 450 cm² of cage area per bird and 10 cm / bird of trough space with an adequate water supply is essential.

Management problems associated with rearing birds in alternative systems have received critical attention and their ‘Welfare friendly’ status is frequently diminished as the project is translated from the experimental to the commercial situation. Alternative systems offer a degree of freedom to the birds, which the battery system fails to satisfy ; they also encourage a greater degree of conflict within the flock and the latter is not commensurate with ‘GOOD’ shell formation.

ELEVATED PLATFORM TYPE CAGE HOUSES FOR LAYERS:

The main purpose of poultry house is to provide comfortable and healthy environment to the birds. Ventilation is a major factor in producing good environment in poultry houses. It also a deciding

influence on the flock performance, disease control and energy used. Ventilation system designed to create the proper flow of air in the shed to keep the birds healthy and protective. A good ventilation system in a house will:

Provide adequate fresh air and oxygen for the birds, thus maintaining a uniform and healthy environment throughout the house.

Provide the desired temperature and humidity – necessary for optimum performance and efficiency of the birds.

control moisture and poisonous gases arising from the microbial fermentation in dropping / litter (ammonia etc.,)

Maintain better conditions minimize incoming dust

Dilute disease- causing organisms.

Allow a large increase in the number of birds per house.

An essential requirement of any ventilation is to have a constant control of air movement in a poultry house. Air volume in summer months must be adequate and in correct direction to ensure uniform distribution throughout the poultry house.

Specification of elevated platform type cage house in layer farms:

4.5- 6.0 feet depending on the capacity of the birds and soil type of that area.

01 Pillar height to lay platform

02 Length of the house

Length can be at any length depending upon the capacity of the birds.

03 Breadth of the house

Breadth of the house is restricted to 30-330feet.

04 Height of the wire mesh

From the platform to overhang 8 to 10 feet.

05 Height of the house.

14 feet from platform to centre.

06 Arrangement of cages

2- M type cages triple deck in centre of the house + 2-L type cages in two sides.

3- M type cages triple deck, 4 birds / cages compartments.

07. Distance between cage arrangements (Pathway)

2.50 to 2.75 feet.

08. Feeder and drinker

Channel type feeder and waterers

09. Channel type and nipple drinkers

Automatic feeding system + nipple watering system.

09. Side mesh.

Chain link 2 inch x 2 inch

ADVANTAGES IN ELEVATED TYPE CAGE HOUSES IN LAYER FARM:

i. Hens reared in elevated type cage houses attained 50 % egg production earlier than other systems.

ii. Bird reared in elevated type cage houses resulted in higher hen-housed and hen-day production.

iii. Eggs collected from elevated cages houses had better shape index, Haugh unit and yolk colour scores.

ENVIRONMENTALLY CONTROLLED LAYER HOUSES

An environmentally controlled layer house is one which inside conditions is maintained as close as possible to the bird's optimum requirements. The house is closed and insulated and trusts on artificial ventilation and air movement. The structural make up is similar to that of elevated platform layer houses. Large number of layers may be accommodated in these houses.

In the environmentally controlled layer houses air is mechanically moved inside, the width of the house greater and is 40' making it more economical to construct. To provide working comfort the side height of the house at the eaves should be 8'. To minimize heat gain in summer and heat loss in winter the ceiling must be fully insulated and it should be wash proof. Care must be taken to see that there is no air leak in the roof. Double walled plastic curtains along the side walls with which arrangements to open or close are to be provided. The curtain should have an overlap of 3"- 4" over the side wall to prevent leakage of air. The floor should be of concrete or watertight stone slabs.

ADVANTAGES OF ENVIRONMENTALLY CONTROLLED LAYER HOUSES

a. Number layers can be accommodated.

b. Less labour and more efficient working atmosphere.

c. Less feed wastage and more feed efficiency.

d. Less fuel cost in turn less cost of production.

e. Less cost of medication and more livability.

f. Higher egg production and more profitability.

g. Cleaner egg production.

FUTURE PROSPECTS IN MODERN POULTRY HOUSES AND MANAGEMENT

The above innovations have improved the poultry house environment and permit increased density thereby housing a large number of birds in the same house. With introduction of various devices to control environment in poultry houses, it would not be long before microprocessors would be used to monitor temperature, humidity, noxious gases, and consumption of water, feed

and the light. Also devices to collect eggs, computer record keeping would expedite these processes.

Lecture 5: Care and management of layers.

Layer Management: From the point of lay to one year it is called laying period.

When first egg laid – Pullet – pullet egg.

Floor space : 2 sq.ft.

Feeder space : 4 sq.ft.

Water space : 2 sq.ft.

Nest space : 1 box for 5 birds

Litter Depth : 6 box for 5 birds.

Feeding : Layer mash is fed during this period - 18% protein. Daily ration is decided and issued two to three times in a day. This helps in lesser feed wastage and better balancing.

Choice feeding of calcium : Calcium is supplied to the birds in feed. Supply of calcium in the feed assures a more uniform intake of calcium by all the birds.

For hens in very high egg production and in high environmental temperature supplementation of extra calcium is necessary. This is given in the form of shell grit. 5-10 Kgs./100birds/Month.

Lighting : Layer birds has to be kept with a period of at least 16 hours a day. Twelve hours of day light is supplemented with additional 4 hours night lighting. It is introduced as step up programme.

20th week

6-6 ½ PM

5.30 – 6.00 AM

21st week

6-7 PM

5 - 6 PM

22nd week

6-7.30 PM

5 – 6 AM

23rd week

6 – 8.00 PM

5 – 6 AM

24th week

6 – 8.30 PM

5 – 6 AM

25th week

6 –9.00 PM

5 – 6 AM

Light stimulates anterior pituitary gland through brain and the liberation of F.S.H. helps the follicles to mature.

A forty watts bulb at a height of 7 feet with 100 feet distance from another, will provide the required intensity of light for 100 sq.ft. area.

General guidelines :

1. Provide balanced feed.
2. Use clean wholesome water
3. Never reduce the light during laying period

4. Supplement vitamins to relieve stress
5. Deworm once in 45 days.
6. Litter to be raked up once a week
7. Add Lime at 5-10 Kg/100 sq.ft. to keep them dry.
8. Cull-the unproductive birds/then and there.

Vaccination - refer disease

Culling

Cage layer fatigue

Calcium feeding.

Lecture 6: Care and management of broilers.

Broiler management :

Broiler is defined as the tender meated chicken of either sex which grow from 35 to 40 gms of initial weight to 2kg or more in 6 weeks of age by consuming around 4 kg of feed.

0-4 4-8

floor space ½ sq.ft. 1 sq.ft.

feeder space 3 sq.ft. 6 sq.ft.

water space 2 sq.ft. 4 sq.ft.

Brooding and management similar to layer brooding

Feeding : Two types

1. Broiler starter - 0-3weeks - CP 23 – E 2900

2. Broiler finisher - 4-6 weeks - Cp 20 – E 3000

Vaccine : 1. Mareks Vaccine day old

2. R.D.V.F. 5- 7th day

The use of liver stimulants and vitamins help in better feed utilization and better body weight gain.

Mortality and livability

Market weight

Feed conversion efficiency.