Unit D: Animal Evaluation & Processing

7.00 Evaluate agriculture animals.

Objective 7.01

- Critique agriculture animals.

General Livestock Evaluation Information

- Consider
  - Breed
  - Sex characteristics
- For example:
  - Angus heifer will have an overall smaller frame size with a flatter muscle pattern as compared to a Charolais bull of the same age

General Livestock Evaluation Information

- View animals from a distance

- Assess the animal from three positions:
  - Front View
    - inspects the leg structure, muscle and balance of the animal
  - Side View
    - inspects leg structure, muscle and balance
  - Rear View
    - inspects leg structure, muscle and balance

General Livestock Evaluation Information

- As the animal moves and during closer inspection
  - the evaluator can confirm any structural soundness faults

- Structural Soundness
  - All animals should be structurally sound
  - Extra emphasis is often placed on
    - breeding animals
    - those that will live a significant portion of their lives on hard surfaces such as concrete
      - Swine

Common structural soundness problems include:

- Cow Hocked
  - rear view conformation fault. The hock joints on the hind leg sit too close together and the hooves often point away from one another. This conformation fault puts excess strain on the hock and leg joints of the animal.

- Bowlegged
  - rear view and front view conformation fault. The knees or hocks of the animal bow or curve out away from the center of the animal's leg. This conformation fault puts excess strain on the knees or hock and other joints of the front leg.

Common structural soundness problems include:

- Knock Kneed
  - front view conformation fault. The knees of the animal curve in towards one another from the center of the animal's leg. This conformation fault puts excess strain on the leg and shoulder joints of the animal.
- Splay Footed
  - front view conformation fault. The hooves and pasterns of the animal "toe out" or point away from one another. This fault puts excess strain on the pastern and knee joints.
- Pigeon Toed
  - front view conformation fault. The hooves of the animal "toe in" or point inward toward each other. This fault puts excess strain on the pastern and knee joints.

Common structural soundness problems include:

- Buck Kneed
  - side view conformation fault. The knees of the animal are "set out" or too far forward from the center of the animal's leg. This conformation fault puts excess strain on the knee and other leg joints.

- Calf Kneed
  - side view conformation fault. The knees of the animal are "set in" or too far back from the center of the animal's leg. This conformation fault puts excess strain on the knee and other leg joints.

Common structural soundness problems include:

- Post Legged
  - side view conformation fault. The angle of the hock is too straight. This fault puts excess strain on the hip and hind leg joints. The animal cannot walk freely and will show a stilted gait as it moves.
- Sickle Hocked
  - side view conformation fault. The angle of the hock joint is too curved and the hind legs are set too far under the belly of the animal. This fault puts excessive strain on the hind leg joints. This animal will walk with its legs too far up under itself and sometime even clip the front foot in extreme cases.
- Weak Pasterns
  - side view conformation fault. The pastern joint of the animal has an angle that is too steep and appears to "break down." The dewclaw will be too close to the ground as the animal moves. This conformation faults puts excess strain on the pastern and other hoof joints.

General Livestock Evaluation Information

- Evaluation:
  - Take notes on the positive and negative characteristics each animal possess to give the evaluator a better determination of which animal is the best

- Performance records- In addition to physical evaluation, producers also use performance records to effectively evaluate animals. Commercial producers are more interested in performance records while purebred breeders have to use pedigrees and breed characteristics as well as performance data

Beef Cattle, Sheep and Goats

- Market Animals
  - grows quickly
  - converts feed efficiently into muscle
  - display balanced muscle
  - structurally sound

Beef Cattle, Sheep and Goats

- Traits used to select market animals include:
  - Muscling
    - flesh the animal carries and is an inherited trait
    - hindquarter should be deep, thick and full
    - width across the back, loin and rump of the animal should be wide and not show too much fat (finish)
  - Finish
    - amount of fat the animal carries
    - should show some finish but it should be smooth and uniform
  - Carcass Merit and Yield
    - kind and quantity of carcass the animal will produce
  - Balance and Style
    - the general structure of the animal and how its body parts blend together
    - should be correctly proportioned and show fluid movement.

Beef Cattle, Sheep and Goats

- Breeding Animals
  - evaluate based on the characteristics the producer needs to continually improve the overall genetics of the herd

Beef Cattle, Sheep and Goats

- Traits used to select breeding animals include:
  - Feet, Legs and Bone
    - the animal should display strong and straight bone structure with the appropriate angulations to the shoulder, hip, hock and pasterns
    - structural soundness faults make the animal less valuable and can be significant enough to remove (cull) animal from breeding program
  - Body Capacity and Size
    - animals should display long well sprung ribs that tie in smoothly to the front and rear portions of the animal
    - the size of the animal should be proportional to the breed and sex standards, but larger animals compared to others of the same age demonstrate growth ability

Beef Cattle, Sheep and Goats

- Traits used to select breeding animals include:
    - Muscle and Condition
        - should display balanced muscling with adequate condition
        - muscle should be long and smooth and blend from one part of the animal's body to the next
        - condition refers to the amount of fat an animal carrie
        - should carry some flesh to display reproductive potential and their ability to maintain weight
    - Breed Character
        - evaluate animal based on breed standards.
    - Sex Character
        - should display characteristics that are ideal to their respective sex (male or female)
        - males will typically carry heavier muscle throughout while females display a more refined appearance
    - Performance Records
        - productivity measures such as Expected Progeny Difference
            - Allow producers to utilize data in addition to visual appraisal of animal

Swine

- Market Barrows and Gilts- the ideal market hog is a fast growing, firmly muscled, lean animal. Traits used to evaluate market hogs include:
  - Muscle and Finish- refers to the amount of flesh and fat the animal carries.
    - Evaluate muscle from the rear, side and top of the animal.
      - From the rear, the ham should appear full and thick and firm. Evaluate the width through the center of the ham, the width between the hind legs and the turn over the top of the ham.
      - From the top, the loin and back should be wide and the rump full. A groove down the animals back displays muscle definition and leanness.
      - From the side, the hog will form an "arc" shape form head to tail and a long sided animal is more desirable. Also evaluate the length and depth of the ham.
    - Muscled animals, viewed from the top, will display a butterfly shape: narrow head, with a flare in the middle and then again at the ham.
  - Type- refers to the conformation of the hog's body. Evaluates the length of the animal's side and the size of the hog.

Swine

- Breeding Animals
  - traits used to evaluate market hogs are also used for breeding animals. In addition to these traits the following are also considered:
    - Structural Soundness- additional emphasis is placed on structural soundness. Feet and leg and bone structure must support living on concrete
    - Underline Quality for Breeding Sows- due to large litter sizes, breeding sows should display a strong underline to support fetal development. The teats should be small and evenly spaced
    - Performance Records- breeding animals are also evaluated using performance records such as a Sow Productivity Index

Dairy Cattle

- The ideal dairy cow or heifer has solid feet and leg structure, with excellent maternal characteristics. Special emphasis is placed on the mammary system.

- Evaluate animals from a distance and assess from all three views as with other livestock animals.

- The Purebred Dairy Cattle Association developed a Dairy Cow Unified Scored Card to evaluate dairy cattle traits. The score card traits are:
  - Frame- accounts for 15% of the overall score. Evaluates skeletal parts including the rump, front end, back, stature and breed characteristics of the animal.
  - Dairy Strength- accounts for 25% of the overall score. A combination of the dairyness and strength that supports sustained production and longevity. Evaluates openness, angularity and strength of the ribs, chest, barrel, thighs, neck, withers and skin.
  - Rear Feet and Legs- accounts for 20% of the overall score. Evaluates the mobility of the animal and feet and rear leg structure.
  - Udder- accounts for 40% of the overall score. Evaluates the udder depth, teat placement, rear udder, udder cleft (suspensory ligament), fore udder, teats and the balance and texture of the udder.

Physical Characteristics of Live Poultry

- Commercial Broilers and Turkeys
  - Most producers of broilers and turkeys have no input in selecting the baby chicks or poults because they are grown on contract
  - Broilers and turkeys must be healthy and well-fleshed or muscled with normal confirmation or shape and have only slight defects to produce a Grade A carcass or dressed bird.

Physical Characteristics of Live Poultry

- Laying Hens
  - Evaluated in reverse or culled based on less desirable characteristics or lower production.
  - Three things are considered when culling layers
    - present production
    - past production
    - rate of production
  - A hen that is laying
    - has large, bright red, soft and waxy comb and bright eyes, and a non-layer has smaller, pale and scaly comb and dull eyes
  - Past production
    - indicated by the amount of yellow pigment left in the body and the time of molt. The more eggs that have been layed, the less pigment that will be left in the chicken's parts

Physical Characteristics of Live Poultry

- Pigment bleaches or leaves the body of a laying hen in this order:
  - Vent
  - Eye ring
  - Ear lobe
  - Beak starting at the base
  - Front of shanks
  - Rear of shanks
  - Tops of toes
  - Hock joint

Physical Characteristics of Live Poultry

- Three things to remember:
  1. A hen that is only bleached in the vent has layed less eggs than a hen that is bleached in both the vent and the eye ring
  2. A hen that has yellow pigment in only the hock has layed more than any other hen except one that has bleached in the hock so that she has no yellow pigment left
  3. A soft and pliable abdomen and a moist, enlarged and bleached vent indicate the hen is currently laying eggs or is in production.

Grading Ready-to-Cook Broilers and Turkeys

- United States Department of Agriculture Grades A, B or C
  - used to indicate quality of dressed birds or carcasses.
  - grades do NOT indicate health or cleanliness
- Factors Used to Determine USDA Grades
  - Confirmation
  - Fleshing (muscle)
  - Fat covering
  - Exposed flesh on breast and other parts
  - Discolorations
  - Disjointed and broken bones
  - Missing parts
  - Freezing defects
- General rules the more things wrong, the lower the grade
- Larger carcasses can have more exposed flesh and more discoloration for the same grade.
- Grade C is the lowest grade regardless of how bad the carcass is damaged

Grading Eggs

- The United States Department of Agriculture sets standards for weight classes and grades of eggs
- General Rules for Grading Eggs
  - The more things wrong, the lower the grade.
  - Foreign material such as manure, egg yolk, blood, etc. makes egg grade dirty
- Grades of eggs are based on four factors:
  - Shell
    - exterior evaluation of the egg
  - Air Cell
    - size determines grade and indicate the age of the egg
    - should show unlimited movement when evaluated
  - White
    - albumen (white) should be clear and firm instead of weak and watery
  - Yolk
    - should be slightly defined and free from defects
    - should not be enlarged and flattened

Grading Eggs

- To determine the interior quality of an egg, it is candled
  - process where a high intensity light shown through the egg displays the interior quality
- Interior quality grades are:
  - AA
    - air cell 1/8" or less.
  - A
    - air cell 3/16" or less
  - B
    - air cell is larger than 3/16"
  - If blood is found, it is labeled bloody and rejected for sale and human consumption

Grading Eggs

- Exterior quality grades are:
  - AA- clean, unbroken shell, with a practically normal shape, texture, and thickness.
  - A- clean, unbroken shell, with a practically normal shape, texture, and thickness.
  - B-clean to slightly stained, unbroken but abnormal due to ridges, excess thickness, etc.
  - Dirty- dirt or foreign material present. Prominent stains can also be present or moderate stains in excess of B quality shell.
  - Grades are based on shell cleanliness, shape, texture, thickness, ridges or checks (cracks).
  -

Objective 7.02

- Interpret genetics.

Animal Genetics

- **Genotype**
  - **kinds of gene pairs the animal has**

Dominant Genes

- **Genes in a pair that hides or dominates the effect of the other gene in the pair**
- **Indicated by upper-case letters**
- **P=polled**

Recessive Genes

- **Genes that are hidden or covered by the dominant gene in the pair**
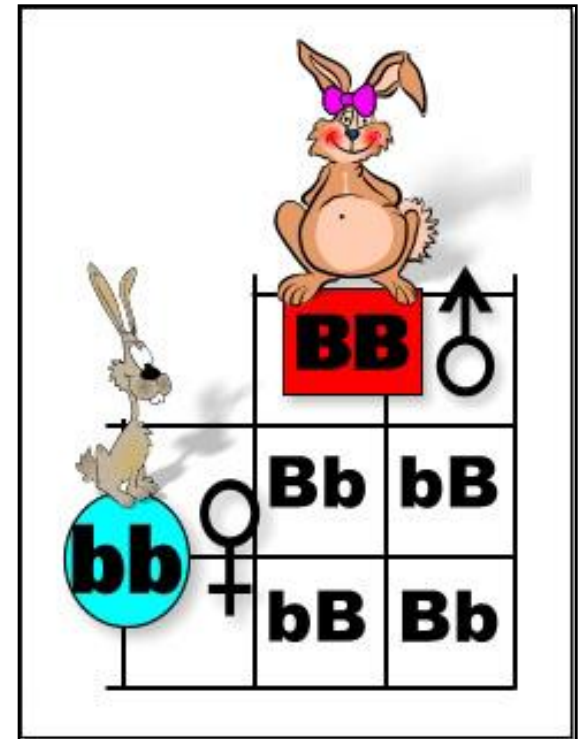- **Indicated by lower-case letters**
- **p = horned**

Homozygous

- **Homozygous gene pair carries two genes for the same trait**
  - **PP = polled and polled.**
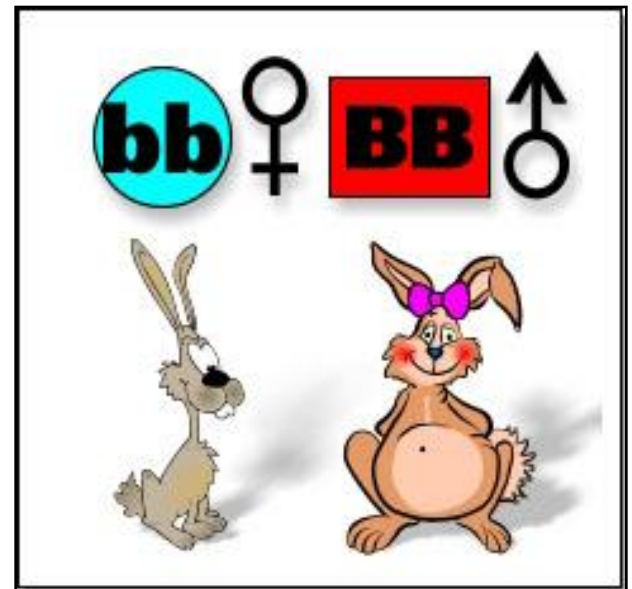
Heterozygous

- **Heterozygous gene pairs carries two different genes that affect a trait**
 - **Pp = polled, horned**

Sex Determination

- Half the sperm carries an X chromosome and one half carries a Y chromosome
- All the ova carry an X chromosome
  - Male offspring in mammals
    - XY
  - Females
    - XX
- In poultry the chromosome configuration is opposite of mammals

Sex-Linked Characteristics

- Some traits are carried on only the X chromosome and some on only the Y chromosome
  - Traits on the Y chromosome are transmitted only from fathers to sons
- Certain genes are expressed in only one sex although they are carried by both sexes
  - milk production
  - egg laying
  - rooster tail feathers
- Sex-linked traits are often recessive and are covered by dominant genes
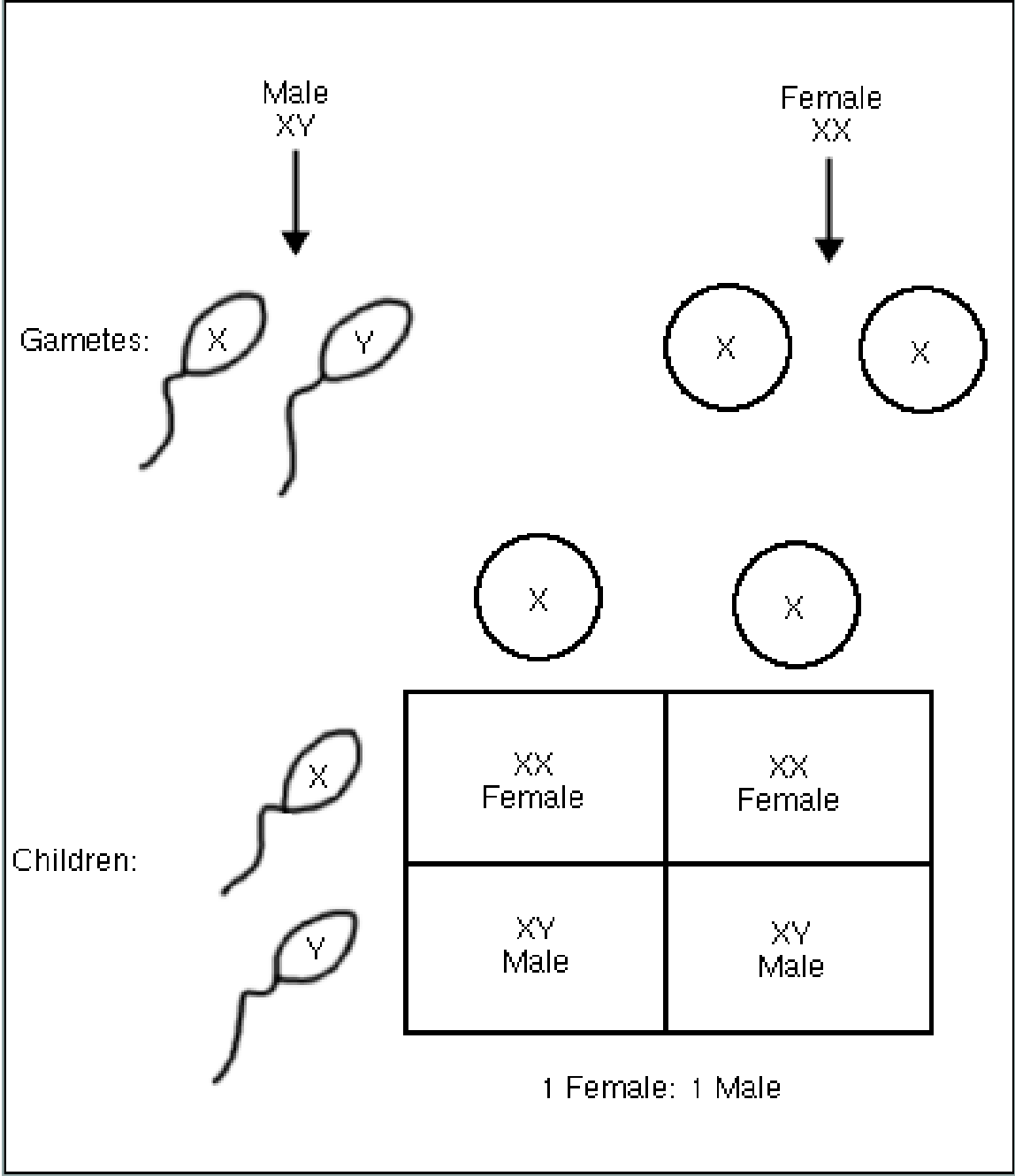
Incomplete Dominance

- Takes place when one gene does not completely hide the effect of other gene
- The offspring has a mixture of the two traits
 - Roan color is a mixture of red and white

Linkage

- The tendency for certain traits to appear in groups in the offspring because the genes for those traits are located near each other on the chromosome and stay together to pass traits in groups

Crossover

- Chromosomes cross over one another and split to form new chromosomes with different combinations of genes

Crossover
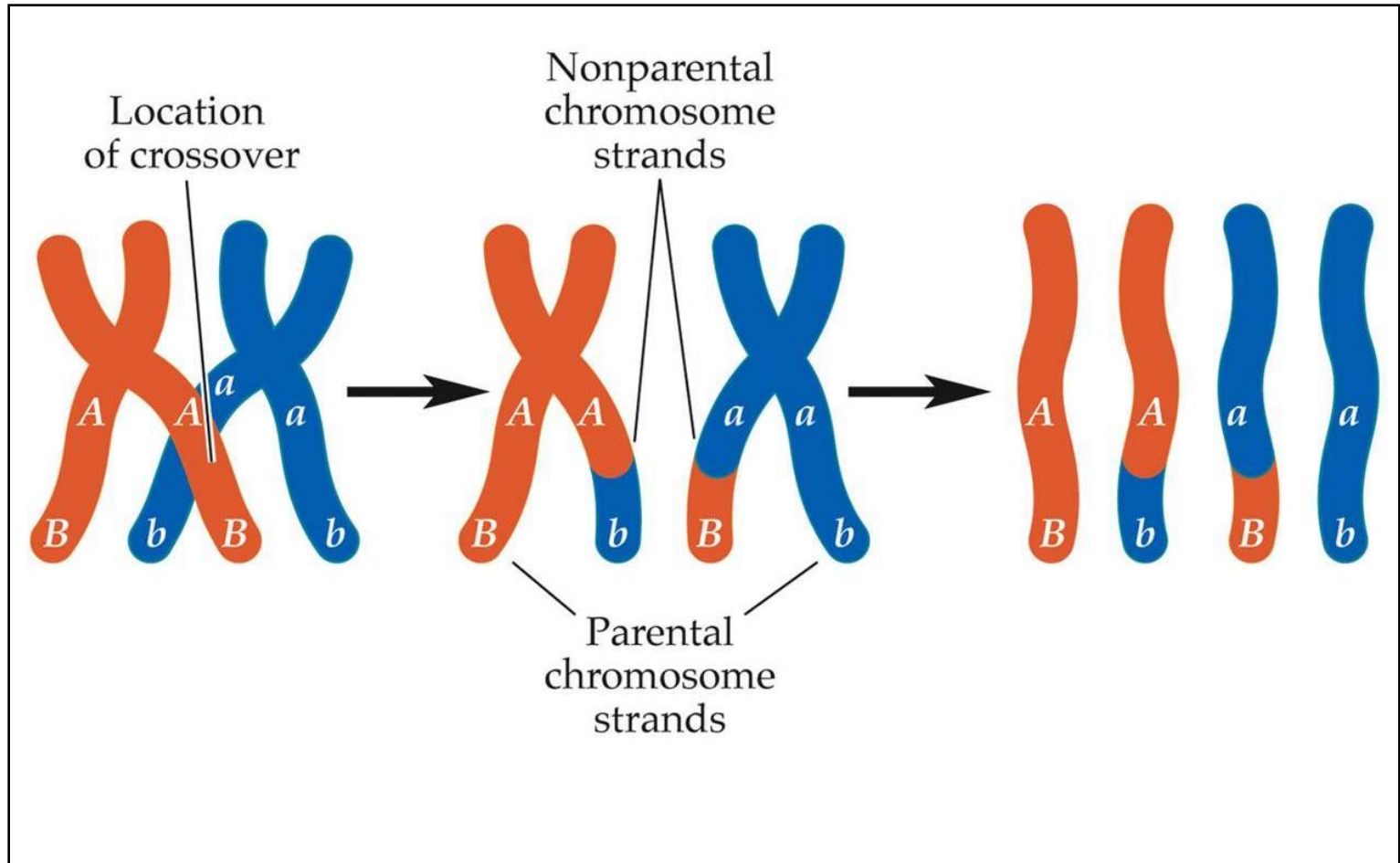
Mutation

- A new trait appears

- Did NOT exist in the genetics of either parent

Punnett Square

- Used to predict the results of crossing animals
  - Male gametes are shown across the top
  - Female gametes are shown down the left side

Punnett Square

P= Polled

p= horned

Example:

- Two polled cattle that are homozygous for the polled trait

	P	P
P	PP	PP
P	PP	PP

Polled Dam

Punnett Square

N= Normal size

n= Dwarfism

Example:

- Normal size in cattle is dominant to dwarfism

Sire

Dam

	N	N
N	NN	NN
n	Nn	Nn

Punnett Square

N= Normal size

n= Dwarfism

Example:

- What if both parents are carriers for a trait or disorder?

Sire

Dam

	N	n
N	NN	Nn
n	Nn	nn

What is the probability that a Homozygous dwarf calf is born?

Objective 7.03

- Apply the use of production records

Animal Production Records

- Helps the livestock producer measure the overall efficiency of their operation from a production and economic standpoint.

- Identifies superior animals the producer should use for breeding stock.

- Identifies inferior animals that need to be culled (removed) from the herd.

- Helps identify management and/or health problems.

Types of Production Records

- Heritability Estimates
  - Encourage producers to select animals based on desired traits.
  - Vary considerable for various traits ranging from almost 0 to 70 percent.
  - Fertility is from 0-10 percent which indicates that management affects these traits more than genetics.
  - Carcass traits have higher heritability estimates and therefore can be improved faster through selective breeding or genetic improvement.
- Reproductive Performance- records on the breeding animals and the overall herd.
- Growth and Size- provides information on the breeding and market animals.

EXAMPLES OF HERITABILITY ESTIMATES FOR CATTLE

Trait	Heritability (%)
Number born	5
Calving interval(fertility)	10
Percent calf crop	10
Services per conception	10
Conformation score at weaning	25
Cancer eye susceptibility	30
Gain on pasture	30
Weaning weight	30
Yield grade	30
Carcass grade	35
Age at puberty	40
Birth weight	40
Body condition score	40
Carcass—percent lean cuts	40
Conformation score at slaughter	40

Types of Cattle Production Data

Cow and Heifer Reproductive Performance Data

- Conception Rate- measures the number of cows that conceived compared to the total number that were exposed to the bull in a breeding season. Formula:
  - Conception Rate = number of breeding age females that become pregnant/total number exposed to a bull during breeding season.
- Calf Crop Percentage (born)- the number of calves born compared to the total number bred. Formula:
  - Calf Crop Percentage Born = calves born / cows exposed to bull during breeding season.
- Calf Crop Percentage (weaned)- the number of calves weaned compared to the total number bred. Formula:
  - Calf Crop Percentage Weaned = calves weaned / cows exposed to bull during breeding season.
- Calving Interval- herd average of the length of time between calving for each cow in the herd that is breeding age.

Bull Reproductive Performance Data

- Fertility Testing of Bulls- bulls should be tested for fertility before breeding season.
- Estimated Breeding Valve (EBV)- includes the individual's performance record and records of relatives and is expressed as a percentage compared to the average of the animals to which the bull was compared. For example, 105 is 5 percent above average, 95 is 5 percent below average.
- Expected Progeny Difference (EPD)- the ability of the sire to transmit genetic traits to progeny (offspring).
  - Measures the difference between the progeny of the bull and the average progeny of the breed.
  - Calculated from the progeny of the bull. Therefore, bulls with more progeny have a more accurate EPD estimate.
  - Examples of EPD data:
    - Birth Weight EPD (BW)- expressed in pounds. Predicts the average size of the calves at birth. A lower number is typically more desired.
    - Weaning Weight (WW)- expressed in pounds. Predicts the sire's ability to transmit growth from birth to weaning to the sires offspring.
    - Yearling Weight EPD (YW)- expressed in pounds. Predicts the sire's ability to transmit yearling growth to his offspring.
    - Maternal Milk (Milk)- expressed in pounds. Predicts the sires genetic merit for milk and mothering ability that will be seen in the sires daughters.
    - Ribeye Area (RE)- expressed in square inches. Predicts the difference in area of ribeye compared to other animals within the breed.
- Pedigree Index (PI)- the closer the animals in the pedigree are to the bull being evaluated, the more effect their performance traits have. A pedigree is a record of an animal's ancestry. For example, the sire has one-half and the grandsire has one-fourth of the EPD.

Cattle Growth Performance Data

- Adjusted Weaning Weight- uses a formula to measure weaning weight of calves on an equal basis.
    - Adjusted to a 205 day period so all calves in the herd can be compared on an equal basis.
    - It takes into account the age of the dam, age of the calf and the sex of the calf.
    - The producer uses this information to measure both the calves and the cow's productivity.
    - If a birth weight was not recorded, a standard birth weight table can be used.
    - After calculation is made, an adjustment is made to account for the age of the dam.
    - Adjusted Weaning Weight Formula

Cattle Growth Performance Data

- Adjusted WW= <u>Actual Weight-Birth Weight</u> X 205 + Birth Weight
- Age in Days
  - Yearling (365 days) and Long Yearling Weights (452 or 550 days)- uses a formula to measure productivity of the animal at approximately 1 year of age.
  - Post Weaning Rate of Gain (minimum 140 day on test)- measures the animals rate of gain after weaning for a specified time period.
  - Average Daily Gain- measures how much weight the animal gained over a specified period of time. Formula:
- Average Daily Gain = pounds of gain on test / days on test.
  - Feed Efficiency- measures the animal's ability to convert feed into pounds of gain. Formula:
- Feed Efficiency = amount of feed / amount of gain.

Types of Sow & Boar Production Data

- Sow Productivity Index- uses a formula that includes the number of live pigs born and adjusted 21-day litter weight for individual sow compared to a contemporary group of sows.

- Number of Live Pigs Born per Litter- compares the average number of piglets born alive compared to an average.

- Litter Weight at Weaning- adjusted to 21 days.

- Expected Progeny Difference- evaluates both reproductive and carcass traits similar to those evaluated in the cattle industry. Backfat is also evaluated in the swine industry.

- Pre-Weaning Survival Percentage- measures the percent piglets that survive from farrowing to weaning. Formula:

- Pre-Weaning Survival Percentage = number of piglets weaned / number born alive.

Swine Growth Performance Data

- 250lb Live Weight Adjustment- evaluates swine growth compared to the group. Adjusted to 250 pounds.

- Rate of Gain = pounds of gain on test / days on test.

- Feed Efficiency = amount of feed / amount of gain.

- Carcass Merit
  - Fat thickness over loin or backfat thickness.
  - Loin-eye area.
  - Percentage of lean cuts.

Types Poultry Production Data

- Past Performance
  - looks at the performance of other birds in that pedigree
- Present Performance
  - evaluates the individual and siblings
- Rate of gain and feed efficiency for broilers

- Use of Poultry Production Records
  - The type of record used to select poultry by pedigree is past performance.
  - The type of record used to select poultry by physical appearance of individuals and their brothers and sisters is present performance.
  - If all the birds in the flock are high performers, the most effective present performance selection method for breeding stock is family selection, NOT individual selection.
  - Checking or testing the offspring which is called progeny testing is the only certain method to determine the ability of an individual bird to transmit genes to most of its sons and daughters.

Breeding Gilts

Number	Number Born Alive EPD	Litter Weight EPD	Dam's SPI	Days to 230 EPD	Backfat EPD
1	.10	1.05	109.5	-.45	-.02
2	.85	3.06	140.0	-4.50	-.10
3	.25	1.25	116.7	-.85	-.05
4	.30	1.20	115.9	-.90	-.06

Scenario for Breeding Gilts

Place these gilts as they are to be used as replacements in a breeding operation whose primary purpose is to produce terminal boars that will be mated to crossbred females. Your farm is located in Wilson County, North Carolina and all hogs are raised in total confinement.

Crossbred Yearling Ewes

Rank these ewes in the order you would select them as potential replacements in a commercial sheep flock. All male progeny from this cross will be feed out and sold on the specialized meat market. Ewe lambs from this cross will be sold as commercial farm flock ewes, potential buyers place emphasis on the National Scrapie Eradication Program. Feed and labor resources are minimal.

Number	Birth Date	Rearing Type	Codon 171	Weaning Weight	Post Weaning Weight	Maternal Milk
1	2/12/09	Twin	QR	2.9	4.5	0.7
2	2/28/09	Twin	RR	4.7	12	1.1
3	3/2/09	Single	QQ	3.2	6	1.2
4	3/4/09	Triplet	RR	3.6	7.4	0.9

State FFA Livestock Judging Contest

April 3, 2007

Yearling Angus Heifers #1

Scenario

Select these females to be used in a purebred operation. This operation promotes quality cattle both phenotype and genotype. The top females and bulls from this operation will be shown in open shows at both state and national shows, so there is a strong emphasis on balance and look in their cattle. The bottom percentage of cattle are sold as feeder calves at the state graded feeder calf sale. Labor and resources are above average.

Performance Data

Number	Tag / Brand	Birth Date	Birth Weight	Weaning Weight	Yearling Weight	Milk
1	605	9/4/05	1.0	39	77	26
2	619	9/28/05	2.5	41	65	19
3	631	11/3/05	3.1	48	73	23
4	635	11/16/05	3.7	40	64	22
Angus Breed Averages			2.3	39	73	19

*EPD stands for "Expected Progeny Difference"