Green Genes: a DNA Curriculum
Massachusetts 4-H Program

Activity #7: Breeding for Survival

Time: 20-30 minutes

Background:
Tennessee Fainting Goats are a Heritage Breed that has very low numbers. These goats were used as the "sacrificial lambs" of sheep owners due to their tendency to faint (myotonia congenita) when threatened. Therefore when a herd of sheep were threatened by wild predators such as coyotes the goat would draw their attention when it fainted. Massachusetts 4-H placed several goats with 4-H in 2004. This activity will allow you to select small breeding herds.

The animals have a condition called myotonia congenita that makes their muscles contract and stiffen when startled. It is caused by recessive genes. The goats were first discovered in Tennessee in the late 1800s. Farmers would have them in with their sheep flocks, and in the light of danger they would freeze up and keel over. The sheep would run away serving as a "sacrificial goat".   With this condition as sudden as a lightning strike, one of the animals may be trotting happily along one minute, and then, seconds later, be on its back with legs up in the air as stiff as a board. They have become endangered and there are less than 3,000 in the United States. In 2004 Swiss Village Farm in Newport R.I. worked in partnership with UMass 4-H in placing some of these animal with 4-H'ers.   The goats are known for their meat, good disposition and easy care. Massachusetts is the only state who currently has Heritage Breeds clubs of which there were five in 2004.

Goals:
- Introduce the concept of herd management
- Discuss genetic diversity verses compatibility

Group Size: Best in groups no larger than 5

Supplies/Preparation:
- Enough Name and Logic Cards for one set per group
- Scissors
- Pencil/Paper
- Optional: Information on Heritage Breeds

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Teaching Tips::
- Begin the activity by discussion about breeding animals. What do farmers, zoo keepers and even 4-H members have to think about? What measure would help them be successful? What problems would they want to avoid?
- When developing breeding programs, both zoologists and farmers make the best matches between animals by studying studbook information. A studbook is a comprehensive record of all births, deaths, and transfers of a particular species. This record helps to prevent inbreeding individuals by tracking related animals and they can also tell about each animal's personality/mothering traits as well as what individuals they do and don't get along with.

Directions:
1. Divide the group into small working groups (4-6). Tell them they are in charge of placing a group of Tennessee Fainting Goats with several 4-H'ers in a new breeding program.
2. Give each group a set of *Logic* cards and *Name* cards.
3. Instruct the group to place the goats into three smaller breeding groups, each containing at least one male and four to five females. (The name cards will help the youth to group the animals and the logic will help with the group structure/compatibility.)
4. Have each group share their results?
5. If time allows have them come up with an alternate grouping and compare and contrast the benefits of each and if there are any potential problems.

DeBrief/Reflect:
- How did you start assigning animals to your groups?
- What did your groups look like?
- What problems/challenges did you run into?
- Did any groups have the same groups? Why or Why not?

Apply:
- Compare how this is this similar to how a farmer or zoo might manage their animals?
- Why are stud books important to keep?
- How does this play into Species Survival Plans for Endangered animal? (You can learn more at www.aza.org/ConScience)

Go further:
- Have the youth create a stud book?
- Have youth assign physical traits for each animal and then re-group keeping genetic diversity relatively high?
- Using what you know about crossing traits- role play out the crosses and record your results?
- Have youth learn about the needs of goats and make their own farm layout with barn and paddock along with feeding plan?
- Have youth pick a Heritage Breed/ Heirloom Crop or Endangered Animal to learn more about.
- Make a presentation or exhibit to share your knowledge with others.

Answer Key: (These are just a few possible scenarios – there may be more correct choices.)
*(M stands for breeding male in group)

A-1	A-2	A-3	B-1	B-2	B-3
Rupert (M)	Donk (M)	Bonkers(M)	Rubert (M)	Donk (M)	Bonkers(M)
Sheila	Lois	Olivia	Lois	Dolly	Little Buck
Beth	Bonnie	Clarice	Bonnie	Sarah	Rocker
Robin	Iris	Dot	Ottie	Olivia	Beth
Little Buck	Dolly	Starfire	Robin	Starfire	Iris
Rocker	Rena	Ottie	Sheila	Clarice	Rena
Ella	Debbie	Sarah	Dot	Ella	Debbie

Name Cards (M-males)

Ella	Debbie	Sarah
Olivia	Starfire	Dolly
Clarice	Beth	Dot
Sheila	Iris	Rena
Bonnie	Robin	Lois
Donk (M)	Rupert (M)	Ottie (M)
Bonkers (M)	Rocker (M)	Little Buck (M)

Logic Cards

Little Buck and Rocker Don't get along with Ottie	Little Buck is Lois' son.	Bonnie is so young, she needs to stay with Lois.
Donk is aggressive toward all other males	Rocker is an immature male.	Ottie is an immature male.
Little Buck is an immature male	Dot is Donk's daughter.	Robin and Beth are aggressive toward Donk.
Robin and Dolly don't get along.	Sheila is Donk's daughter	Sheila and Bonkers were unsuccessful at breeding with one another.