

# Garole sheep of Sunderban, India and IPR issues

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# Garole sheep in native habitat

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# Locally adapted breed supplements incomes

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- Garole sheep reared by smallholders for meat production
- Usually 2-5 ewes per household
- Unique among Indian sheep breeds
  - Adult female weight 12-15 kg
  - Average litter size 1.8
  - Adapted to humid, swampy 'delta' conditions
- Not listed in FAO publication 'Sheep and Goat Breeds of India' (Acharya, 1982)

# Garole sheep in Sunderban





# History of the genetic basis of Garole prolificacy

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- 1970s. Seears brothers of Booroola, near Cooma, NSW, Australia found some Merino ewes in their flock having multiple births
- CSIRO research found in the 1980s prolificacy due to single gene (Booroola or *FecB*)
- Dr. Helen Newton Turner traced Booroola to an early Australian flock known to contain prolific ‘Bengal’ sheep shipped from Calcutta in 1792-93



# The celebrated Booroola gene I

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- First single gene discovered, governing a quantitative animal production trait
- Average litter size of homozygous Booroola Merino 2.6
- Gene mapped to sheep Chromosome 6 (Montgomery *et al.*, 1994)
- Booroola Merino rams and ewes exported to New Zealand and then many other countries



# The celebrated Booroola gene II

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- Booroola mutation identified by AgResearch, NZ (Wilson *et al.*, 2001). Months later, also in France (Mulsant *et al.*, 2001) and Scotland (Souza *et al.*, 2001)
- Mutation is in the sheep BMP1B receptor gene (codon encodes glutamine rather than arginine)
- Role of the BMP1B receptor in fecundity was previously unknown



# Work at NARI, India I

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- Working among small holders rearing Deccani sheep in Maharashtra
- Increasing shortage of grazing
- Farmers said they could reduce the number of sheep reared and earn similar incomes if their sheep would give twins as their goats do

# Typical shepherd with a flock of Deccani sheep

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## Work at NARI, India II (ACIAR funding)

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- 1993. First Garoles brought to Phaltan over 2000 km away, performance recording started
- Segregation of prolificacy (ovulation rate) in backcrosses indicated single gene control
- Average litter size = 1.8

# Garole flock at NARI (2005)

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# Garole ewes with lambs at NARI

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## Work at NARI, India III

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- Same mutation as the Booroola found in the Garole (Davis *et al.*, 2002)
- DNA test (PCR-RFLP) established in India (NCL, Pune) based on published literature
- Breeding program established to introgress prolificacy into Deccani sheep and a composite (2000-2006). Growth and survival traits also included in breeding objective.
- More awareness about the Garole breed in India

# Ewe carrying one copy of *FecB* in smallholder flock near Phaltan

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## US Patent: Mutated BMP1B receptor as regulator of ovulation rate (2003)

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- Patent application claims
  - an isolated DNA molecule
  - method for identifying vertebrates carrying it
  - modulation of a protein's activity to control the ovulation rate in female vertebrates
- Patent covers animals produced in a breeding program if the DNA test is used



## Indian experts' opinions

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- Advice from Gene Campaign: Indian patent law does not allow patenting of genes  
If patent not recognized in India, no royalty need be paid.
- Advice from NABARD, India. “We are free to do what we like”



# Questions

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- Are there going to be restrictions on the use of our own breeds?
  
- How do we tackle them?



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