THE NATIONAL ANIMAL GENETIC RESOURCES CENTRE AND DATABANK (NAGRC & DB) COLLABORATION WITH IAEA AND OTHER STAKEHOLDERS IN ANGR DEVELOPMENT INTERLAKEN, SWITZERLAND SEPT. 2007
Vision Statement

• Optimize livestock production and productivity through animal breeding to improve food security and eradicate poverty in Uganda
Mission Statement

• Take a leading role in establishing a comprehensive National animal breeding programme
STRATEGIC OBJECTIVES

1. Establish breeding structures
2. Establish, develop and maintain well managed Centre farms
3. Recruit and retain competent and trained personnel
4. Establish sound financial systems to provide sustainability and public accountability
5. Marketing to achieve 30% sales growth per year
6. Establish evaluation measurements
Sustainable Development

- NAGRC in conjunction with IAEA is promoting the use of Assisted Reproductive Techniques (ARTs) to improve livestock genetics.
PROMOTE USE OF ARTs: Artificial Insemination (AI)

Collection

Processing

Distribution

KEY
- Districts with Artificial Insemination (AI)
- Land route for distribution of AI inputs
- Air route for distribution of AI inputs.
AI activity in Uganda – 1960 to 2003

Years

Total AI no. performed
PROMOTE USE OF ARTs: Semen from Goats
Sustainable Development

• NAGRC&DB in conjunction with IAEA is promoting the use of ICTs to sensitize farmers on the different genetic improvement programmes
ICT in Artificial Insemination

I. Exploit latest technologies in order to improve and to achieve new goals through continued education of AI technicians, farmers & other stakeholders

II. To have efficient technology transfer to stakeholders
ICT in Artificial Insemination

III. Improve the knowledge, skill & efficiency of AI technicians & trainers

- Access information at own pace e.g. on CDs

IV. Improve breeding efficiency on the farm through use of mngrt. software e.g. Interherd,
Activities offered by ICT

1. Access to most necessary hardware & software

2. Trained Manpower in ICT procurement, use and development ~ 4 staff – also very knowledgeable in Livestock issues especially AI
Activities offered by ICT

4. In-house training of staff & some few outsiders e.g. IAEA fellows in ICT

5. ICT services e.g. Internet accessible to most of the staff at the institution – NAGRC & DB

6. Plan, design, produce and disseminate audio visuals for the various stakeholders e.g. CDs, posters
CDs
NON-PREGNANCY DIAGNOSIS (N-PD)

Early detection of non-pregnant animals

What is N-PD?
The ability to tell a non-pregnant animal as early as 24 days after service (Artificial Insemination or naturally using a male animal) as compared to the conventional method of pregnancy diagnosis, which is done 45 to 60 days after service.

How is it done?
Done in the laboratory through analyzing the levels of progesterone (reproductive hormone) in milk or blood after service (natural or artificial insemination) at three different times within a period of 24 days. Results of analysis will reveal whether an animal has conceived or not conceived.

1. Collecting milk sample
2. Milk sample ready for analysis
3. Analysis of milk sample
ARTIFICIAL INSEMINATION (AI)

Making use of Good Genetics in Males

THE INSIDE STORY

Care of the bull
- Artificial insemination
- Management
- Good diet
- Good nutrition
- Good management
- Good quality semen

Collection of semen
- Looking for the bull
- Artificial insemination
- Collection of semen
- Test for sperm count
- Test for sperm morphology
- Storage of semen

Analysis and processing of semen
- Testing of the semen
- Thawing of semen
- Testing of the semen
- Storing of semen

Production of liquid nitrogen
- Storage of semen
- Production of liquid nitrogen
- Liquid nitrogen
- Liquid nitrogen for storage
- Liquid nitrogen for storage

Insemination
- Insemination
- Artificial insemination
- Deep insemination
- Artificial insemination
- Artificial insemination

Record keeping
- Records
- Records
- Records
- Records

The result...
MULTI-OVULATION & EMBRYO TRANSFER (MOET)

THE INSIDE STORY

SUPER OVULATION

DONOR
Superior Genetics

Hormonal Treatment Induction & Multi-ovulation

Day 0 Oestrus Artificial Insemination

EMBRYO RECOVERY

Day 7 Flushing Recovering of Embryos

Evaluation of Embryos

Transferable

FRESH EMBRYOS

Freezing

Under the Microscope

CRYOPRESERVATION

Embreras

Transfer of Embryos

Multiple offspring from single Donor

SYNCHRONISATION OF OESTRUS CYCLE

RECIPIENTS
Good mothering ability

Hormonal Treatment Induction of heat

Transfer of Embryos Day 6-8

Storage

Thawing

Evaluation of Embryos

Friesian

Jersey

Ankole - Ngabo

Nganda

Australian Milking Zebu

Superior Genetics

Making use of Good Genetics in Females
LIQUID NITROGEN (LN₂) PRODUCTION
For preservation of genetic material e.g. semen, embryos

What is it?
Nitrogen (N₂) is a gas found in the atmosphere like other gases such as oxygen which animals breath in.
Atmospheric air has a composition of 78% Nitrogen, 21 % Oxygen and 1% inert gases.
N₂ is produced by the LN₂ plant using physical means i.e. no chemicals are involved.
Atmospheric air is pressurised
N₂ gas is extracted from the pressurised air
cooled, and
at a temperature of -196°C, liquefies hence the name liquid nitrogen.
-196°C, is appropriate for preservation of simple living particles such as sperms, ova, embryos, viruses, bacteria, etc. for over 40 years.

LN₂ plant

THE INSIDE STORY

FILTER MAT
Air from the atmosphere is sucked through a filter mat which removes dust particles, smoke, small insects etc.

COMPRESSION
Air is cooled, compressed to a pressure of up to approximately 10 bar.

GAS SEPARATOR
Separates N₂ from the compressed air.

CRYOGENERATOR
Super cools the N₂ gas to a temperature of -196°C and it turns into a liquid i.e. LN₂

INSIDE LN₂ FLASK

INSIDE LN₂ FLASK

STORAGE TANK
LN₂ is stored in a tank.

LN₂ truck transports LN₂ to Artificial Insemination (AI) sub–centers where AI technicians top up their LN₂ tanks/flasks in which semen or embryos are stored prior to insemination or embryo transfer.

LN₂ truck transports LN₂ to Artificial Insemination (AI) sub–centers where AI technicians top up their LN₂ tanks/flasks in which semen or embryos are stored prior to insemination or embryo transfer.
### The Inside Story

**This is the ability to detect a non-pregnant cow as early as 24 days after service (artificial insemination and naturally using a male animal) as compared to the conventional method of pregnancy diagnosis, which is done 45 to 60 days after service.**

- **This reduces the inter-calving intervals hence improved and increased milk and beef production and thus more income for the farmer.**

### Services Now Available at NAGRC & DB

**A** Animal on Heat
- Very good animal that is on heat and is awaiting service.

**B** Serving the Animal
- The animal is served either using artificial insemination or naturally using a bull.

**C** Milk Collection
- Three milk samples are collected:
  - 1st Milk sample collected on day 0 - day of artificial insemination or natural service
  - 2nd Milk sample collected on day 10 after service
  - 3rd Milk sample collected on day 21 after service

- Milk samples are preserved using sodium azide and can spend 2 weeks outside refrigeration before analysis.
- 3 weeks outside refrigeration before analysis.
- 1 month in refrigeration at 4°C.
- But remember analysis should be as soon as possible!!

**D** Centrifugation
- Centrifugation is done in order to get a fat free portion of the milk sample that has a consistent concentration of protein. This is to ensure prolonged storage of milk samples in a frozen state.
- But the aim is to carry out analysis as soon as possible!!

**E** Analysis
- Analysis is done in the laboratory using Radio Immuno Assay (RIA) where the level of progesterone (reproductive hormone) in the milk or blood samples is tested after service (natural or artificial insemination).

<table>
<thead>
<tr>
<th>Conclusion</th>
<th>1</th>
<th>2</th>
<th>3</th>
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</thead>
<tbody>
<tr>
<td>Animal doesn’t cycle - can’t conceive</td>
<td>Low</td>
<td>Low</td>
<td>Low</td>
</tr>
<tr>
<td>Animal cycling normally - hasn’t conceived</td>
<td>Low</td>
<td>High</td>
<td>Low</td>
</tr>
<tr>
<td>Animal conceived</td>
<td>Low</td>
<td>High</td>
<td>High</td>
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</tbody>
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**F** Results of Analysis

**G** End Result
- The results are taken back to the farmer, such that in case of non-pregnancy detection is done as early as possible i.e. within 24 days after service. This would reduce the inter-calving interval hence the farmer gets more income in terms of calves born and milk produced in the animal’s lifetime.
PROMOTE USE OF ARTs: Multiple Ovulation And Embryo Transfer (MOET)

Super-Ovulated Ovaries

Viewing under the Microscope
NON-PREGNANCY DIAGNOSIS

The ability to tell a non-pregnant cow when actually it's not pregnant, as early as 24 days after AI or natural service.
PURPOSE

• To clinically intervene as early as possible in those cows that are served and
  o fail to conceive
  o whose fetus dies very early

• Reduce on the Inter-calving intervals hence
  o increased milk production
  o Improved and increased beef production
PROMOTE USE OF ARTs: Non-Pregnancy Diagnosis (N-PD)

- Fast detection of pregnancy
- Reduce Inter-calving intervals
Significance

- Detects empty cow at day 21
- Detection of repeat breeding - early
- It allows a farmer to give immediate remedial measure
- It recommends sale for non-productive stock
Current sources of milk

- Mukono
- Luweero
- Masaka
- Kyengera
- Mityana
PROMOTE USE OF ARTs: Non-Pregnancy Diagnosis (N-PD)

Commonest problems reported

- Early reporting & insemination
- Late reporting & insemination
- Cow not cycling
- Early embryonic death
- Cystic ovaries
Sustainable Development

• NAGRC&DB is improving farmers livelihoods through improving their livestock production and productivity

• NAGRC&DB has collaborated with several international agencies to conserve its indigenous livestock:-
Global Collaborations

• Ankole Project
  • NAGRC&DB has collaborated with BOKU and ILRI in characterization and conservation of the Ankole cattle.
Global Collaborations

• Ankole Project

• NAGRC&DB has collaborated with BOKU in hosting their Austrian students and helping them:
  – Understand our agricultural systems
  – Appreciate our indigenous genetics
Global Collaborations

• Food and Agricultural Organization (FAO)

  • Collaboration with FAO in which NAGRC&DB has been helped
Global Collaborations

• Central Artificial Insemination Station (CAIS) - Kenya

• NAGRC&DB has collaborated with CAIS in:-
  - Exchange of technical staff
  - Semen collection and processing techniques
  - Trainings in MOET
Global Collaborations

- National Artificial Insemination Centre (NAIC) - Tanzania

- Collaborated with Tanzania in a ICT project sponsored by IAEA in:-
  - Devising means of conserving our indigenous genetics
  - Development of training modules on heat detection, AI etc
Global Collaborations

• KARI Lanet- Kenya

• Collaboration in Non-Pregnancy Diagnosis (N-PD) in
  – Exchange of Expertise
  – Training in running assays
  – Training in mixing of reagents
Sustainable Development

• NAGRC&DB owns centre farms - breeding and multiplication of livestock for farmers.

• Characterization and selection of indigenous livestock for conservation
NAGRC & DB OPERATIONAL CENTRES

- Headquarters
  Entebbe

- Farms

- Sanga Field
  Station – Operational
  but under MAAIF
Breeding and Multiplication of Exotic Animals

Guernsey, Jersey

Proposed
In Place

Tropical Beef Breeds

Tropical Beef Breeds

Guernsey, Jersey

Boer goats

Commercial milk production

Dairy Goat

Dairy Crosses

Pure Friesian

Commercial milk production

Boer goats

Dairy Crosses

Pure Friesian
Cambrough Pigs

Njeru Stock Farm
Breeding, Multiplication and Conservation of Indigenous Animals

- **E.A black head**
- **Short horn Zebu**
- **Nganda**
- **Ankole**
- **Small E.A**
- **Ugandan**
- **Fish**
- **Nsesere**

Proposed In Place

- **Kibale**
- **Mubende**
- **Kabale**
- **Muganda**
- **Small E.A**
- **Ankole**
- **E.A black head**
- **Short horn Zebu**
- **Nganda**
- **Ugandan**
- **Fish**
- **Nsesere**
Conservation of the Small E. A. Brown Goat

Kasolwe Stock Farm
Conservation of indigenous Mubende Goats
Conservation of indigenous cattle breeds

Bihogo

Nshaara Ranch
Conservation of indigenous cattle breeds
Recommendations

• Promoting the National Breeding Programme
• Conservation of indigenous livestock genetics
• Support of rehabilitation of NAGRC farms
• Funding of the Intervention Budget
Improving Food Security
Eradicating Poverty
through a
Comprehensive National Breeding Programme
THANK YOU