Towards the development of a forage based feeding system for the small ruminant sector in St Kitts and Nevis

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Presentation outline

• Introduction
  – Small ruminants
  – Forages
  – St Kitts and Nevis
• Research problem and objectives
• Interventions
• Results
• Conclusions
• Way forward
INTRODUCTION
Small Ruminants
Towards being food secure

• Food / fibre/ income
• Wide variety of herbage, landscapes
• Lower investment costs than cattle
• High quality protein source
Small ruminants

- Over 8,900 tonnes of small ruminant meat imported into CARICOM member states in 2011 valued at over US$ 43M
- Demand for small ruminant products expected to increase
- Conditions in the region are suited for SR production
- In recognition of its importance to rural development and poverty alleviation, agricultural diversification and regional food security, CARICOM governments designated the small ruminant industry as a priority area for development
Small Ruminants

CONSTRAINTS

Policy
Absence of clear-cut policy on small ruminants/ or no implementation if they exist
Problems in land tenure (unsuitable or high cost)
Inadequate measures in place to deal with praedial larceny

Production
Natural disasters
Unavailable quality breeding stock or inadequate numbers
FEED. High cost of concentrates, limited supply of agro / industrial by-products.
Deficiencies in the management practices (i.e. pre weaning mortality)

Support systems (credit/ technical or extension) inadequate

Marketing
Small ruminant marketing is currently mainly ad hoc
Unbridled importation of cheap and poor quality old meat
Poor support infrastructures for slaughtering and meat processing to meet intl standards
No established meat quality standards

Agricultural Extension and Economics Dept. UWI (2006)
Forages

- Forages: Grasses, legumes, fodder crops or any other crop used for feeding livestock to supply dietary needs
Tropical grasses

• Major limitation is maintaining at a high nutritive value
• Diverse growth habits
• Generally adapted to high fertility soils
• Respond well to applications of N
• Able to withstand varying levels of water-logging and drought
• Introduced and improved spp. are usually more nutritious
Benefits of forage based feeding systems

- Controlling soil erosion
- Improving soil fertility
- Less reliance on costly concentrates
- Can be dried and pelleted or used as meal
- Roughage required for proper functioning of the rumen
- Marketing tool???
- Must be nutritious
Considerations

• Species grown and land area available
• Reliability of rainfall/irrigation
• Availability of other feed resources
• Number of animal units
• Need for selective grazing
• Avoiding overgrazing
FRAMEWORK – St. Kitts and Nevis

• Closure of sugar industry
• Available land, need for employment
• Agricultural Development Strategy MoAMR

• CARICOM net importer
• Consumer demands
FRAMEWORK – St. Kitts and Nevis - Survey results of CARDI study (2008) show:

- Almost 100% of SR farmers graze their animals
- More than 72% (goat) and 79% (sheep) rely only natural pastures
- Pastures mainly local, scrub vegetation of low quality.
- Little or no pasture management is practised

Small ruminant production systems SK

Farmers practice of small ruminants SK
GAPS and OPPORTUNITIES in SR Production

- On going breeding units and Veterinary SS Projects SK
- High costs of grain (worldwide food crisis)
- Available land (SK)

Forage based production systems
Research Problem and Objectives
Agricultural Diversification: Small Ruminants

Research problem

• Low quantity and quality of forages
• Seasonal availability
• Poor nutrition
INTERVENTIONS

1) Establishment of forage crops
2) Management of forages
3) Harvesting and ensiling technique
4) Animal performance studies
5) Training and outreach
Specific objectives:

a) to incorporate **mulato grass** and **forage sorghum** into feeding systems as alternative species to increase forage production and quality;

b) to introduce **forage conservation** techniques to balance the periods of forage scarcity with the conserved forage from periods of overproduction;
ESTABLISHMENT OF FORAGES, MANAGEMENT, SILAGE PREPARATION
Small Ruminants: Establishment of forages: January to June 2012

• Management / Agronomic Practices for Successful Establishment
• Data collection, observations and sampling

Seeding/ re-seeding

Weed control/Fertilization

Measurements: ruler and quadrat

Sampling: quadrat

Weekly field observation
### MATERIALS AND METHODS Forage Management

<table>
<thead>
<tr>
<th>Agronomic decisions</th>
<th>Forage Sorghum</th>
<th>Mulato II</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Variety</strong></td>
<td>Brown mid-rib hybrid, Great Scott TX</td>
<td>Mulato II, Tropical Seeds FL</td>
</tr>
<tr>
<td><strong>Area</strong></td>
<td>2 hectares</td>
<td>2 hectares</td>
</tr>
<tr>
<td><strong>Planting date and density</strong></td>
<td>March 2(^{nd}) 2012, November 2(^{nd}) 2012</td>
<td>February 3(^{rd}) 2012, April 19(^{th}) 2012</td>
</tr>
<tr>
<td></td>
<td>22 kg seed / ha</td>
<td>11 kg and 18 kg seeds / ha;</td>
</tr>
<tr>
<td><strong>Fertilization</strong></td>
<td>No pre-plant fertilization; 227 kg/ha at 52 d NPK (15:15:15)</td>
<td>Pre-plant fertilization with 110 kg urea/ha; a. No pre-plant fertilization or during growth until April 2012 b. 110 kg/ha NPK (20:10:10) and 200 kg urea/ha after harvest or brush cut (with rain)</td>
</tr>
<tr>
<td><strong>Harvest</strong></td>
<td>May 24, 2012</td>
<td>1(^{st}) harvest: July 27, 2012 2(^{nd}) harvest: November 15, 2012 Brush cut every 6 wk</td>
</tr>
<tr>
<td><strong>Weed control</strong></td>
<td>No pre-plant or growth stage weed control</td>
<td>No pre-plant or growth stage weed control (only re-seeded section); Post emergent broad leaf control</td>
</tr>
<tr>
<td></td>
<td>pre-emergent herbicide and post emergent broad leaf control</td>
<td></td>
</tr>
</tbody>
</table>
**Activity:** RE-SEEDED AREA

**Land preparation**
Ploughed, harrowed, rotorvated to a fine tilth

**2X seeding density** to account for low germination rate;
Decreased depth of seeding
2.5 – 3.8 cm depth, with beet seed plate

**Incorporated fertilizer**
NPK (20:10:10) rotorvated into soil at rate of 110 kg/ha;
- Strategic re-fertilization with
- N fertiliser with the rain

**incorporated herbicide**
pre-emergent herbicide pendimethalin (Prowl) applied 2 wk before planting;
2,4-D dichlorophenoxyacetic acid applied for broad leaves (July 5, 2012)
ESTABLISHMENT: MULATO GRASS

Seeded Mulato grass area at Belle Vue

Emerging Mulato grass at Belle Vue
# Measurements and sampling summary

<table>
<thead>
<tr>
<th>FORAGE</th>
<th>Silage</th>
</tr>
</thead>
<tbody>
<tr>
<td>(mulato and forage sorghum)</td>
<td>(mulato and forage sorghum)</td>
</tr>
<tr>
<td>Forage establishment - (quadrat method) (height, soil coverage, # tillers, weeds)</td>
<td>Kg forage ensiled</td>
</tr>
<tr>
<td>Plant maturity: physiological state</td>
<td>Successful storage, post harvest losses (Kg spoiled forage)</td>
</tr>
<tr>
<td>Weed development (area covered, type)</td>
<td>Monthly pH</td>
</tr>
<tr>
<td>Kg of biomass produced (quadrat method)</td>
<td></td>
</tr>
</tbody>
</table>

**Environmental:**
- weed development, f. sorghum invasiveness, covered soil erosion in forage crop lands,
- composition and proportion of natural forage spp
Results
Results

Soil cover (%)

Plant height

Biomass yield
RESULTS

ESTABLISHMENT OF Mulato grass

% of area covered by mulato grass along the year

- Mar-01
- Jul-10
- Aug-22
- Sep-05, Oct-26

- mulato grass
- dry material and weeds
- bare soil
RESULTS
Mulato II establishment

Area covered %
- mulato grass
- dry material and weeds
- bare soil

4 weeks
- 10%

5 weeks re-growth
- 75%

12 weeks re-growth
- 98%
RESULTS BIOMASS production of Mulato II

- seeded in the dry season with great weed infest.; re-seeded areas
- 7-16 lb/acre; 35% germination rate
- 12 wk growth in dry season; patched re-seeded areas
- fertilized 100 lb/acre NPK[20:10:10]
- herbicide: late control in seeded, pre-emergent in new areas

CARICOM P. July 10, 2012
Belle Vue - St. Kitts

- 3.5 wk re-growth in the rainy season
- 10,184 kg/ha

CARICOM P. August 22, 2012
Belle Vue - St. Kitts

- seeded: beginning of rainy season
- 7 lb/acre; min 60% germ. rate
- 6 wk growth
- fertilized 178 lb/acre/year
- herbicide: pre-emergent and contact herbicides

13,354 kg/ha

Research plots (2007-08)
CARDI Trinidad/ SFC Research Station

- 4,783 kg/ha

RESULTS

BIOMASS Production Forage Sorghum

Kg dry matter/ha

Dry season

82 d
1,874
50 d re-growth
352

Kg dry matter/ha

Rainy season

32 d
804
46 d
1,818
67 d
3,241
81 d
6,299
23 d re-growth
674
RESULTS Silage Production Forage Sorghum

Methodology: harvest, filling, compaction and storage

4.21 (6 weeks)
# RESULTS  Silage Production Mulato grass

<table>
<thead>
<tr>
<th>Date of silage preparation</th>
<th>Date of Measurement</th>
<th>Days of conservation</th>
<th>pH</th>
<th>Conditions of preservation</th>
</tr>
</thead>
<tbody>
<tr>
<td>July 27, 2012</td>
<td>September 20, 2012</td>
<td>1 month</td>
<td>5.64</td>
<td>acceptable</td>
</tr>
<tr>
<td>July 27, 2012</td>
<td>January 22, 2013</td>
<td>6 months</td>
<td>4.47</td>
<td>very good</td>
</tr>
<tr>
<td>July 27, 2012</td>
<td>February 20, 2013</td>
<td>7 months</td>
<td>4.5</td>
<td>very good</td>
</tr>
<tr>
<td>November 10, 2012</td>
<td>January 22, 2013</td>
<td>2 months</td>
<td>4.6</td>
<td>good</td>
</tr>
<tr>
<td>November 10, 2012</td>
<td>January 22, 2013</td>
<td>2 months</td>
<td>4.95</td>
<td>good</td>
</tr>
<tr>
<td>February 2013</td>
<td>February 20, 2013</td>
<td>3 weeks</td>
<td>4.32</td>
<td>very good</td>
</tr>
<tr>
<td>February 2013</td>
<td>February 20, 2013</td>
<td>3 weeks</td>
<td>8.32</td>
<td>spoiled</td>
</tr>
</tbody>
</table>
# RESULTS silage conservation

<table>
<thead>
<tr>
<th>Date of silage preparation</th>
<th>Date of Measurement</th>
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<tr>
<td>January 22, 2012</td>
<td>February 20, 2013</td>
<td>1 month</td>
<td>4.33</td>
<td>very good</td>
</tr>
</tbody>
</table>
## RESULTS

Forage harvested and stored

<table>
<thead>
<tr>
<th>FORAGES</th>
<th>Total established</th>
<th>Ensiled forage (kg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Forage sorghum Cycle One</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dry Season</td>
<td>2.0 has (5 acres)</td>
<td>23,595</td>
</tr>
<tr>
<td>Rainy Season</td>
<td>2.0 has (5 acres)</td>
<td>3,243</td>
</tr>
<tr>
<td>Mulato grass</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dry Season</td>
<td>2.0 has (5 acres)</td>
<td>3,060</td>
</tr>
<tr>
<td>Rainy Season</td>
<td>2.0 has (5 acres)</td>
<td>6,050</td>
</tr>
</tbody>
</table>
ANIMAL PERFORMANCE
**Methodology:**

**Sites:** Bourkes & Belle Vue

<table>
<thead>
<tr>
<th>5 farms</th>
<th>DIETS</th>
</tr>
</thead>
<tbody>
<tr>
<td>5 animals</td>
<td>Control</td>
</tr>
<tr>
<td>5 animals</td>
<td>Treatment</td>
</tr>
</tbody>
</table>

**Legend:**
- **confinement area: control group**
- **confinement area: treatment group**
- **farm's perimetral fence**
- **confined animals fence**
### Measurements summary:

- Live body weight, change
- Consumption (offer - refused)
- Average daily gain
RESULTS Animal Performance Studies

Daily gain (96 d after weaning) of sheep supplemented with Mulato grass silage in St. Kitts.

<table>
<thead>
<tr>
<th>Condition</th>
<th>ADG (g/day)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control (natural pasture)</td>
<td>49</td>
</tr>
<tr>
<td>Natural pasture + Mulato grass silage</td>
<td>57</td>
</tr>
</tbody>
</table>
TRAINING AND OUTREACH
Training and Outreach activities

• Trained field personnel in small ruminants systems
  – Training sessions conducted in 2012
  – Topics included:
    • Small Ruminant Management: Breeds and Breeding, Feeds and Feeding and Health Management
    • Tropical forage establishment, production, conservation and utilisation focusing on Mulato II and Forage Sorghum
    • Data collection
  – Target audience: Project officers, extension officers, field workers and private ruminant farmers. Total of 19 persons.

• Project led to the establishment of 20 acres of Mulato II on 5 SR farms.
CONCLUSIONS

• Mulato II and Forage Sorghum can be grown and ensiled successfully in SK which will increase year round availability of good quality forages

• Reduced dependence on grains and poor quality forages will increase productivity

• Technology transfer through training and demonstration
“Impact of interventions on food security in the region”
Possible impacts/outcomes

• Increase in quality and quantity of forages

• Reduced seasonal shortages through the introduction of a forage conservation technique

• Creation of downstream activities like commercial forage conservation/sales

• Increased farmers income through lower cost of production and increased productivity
Possible impacts/outcomes

• Increased supply of animal protein in the market place, reduction of imports

• Appropriate farm model for the region

• Alternate use for underutilized land in SK: sustainable agriculture

• Mechanized service to attract women interest in small ruminants production (reduce effects of heavy duties of cut & carry)
Challenges

• Hurricane Rafael
• Management of the silage bags
• Forage management
Way forward

• Evaluate the impact of supplemental feeding of mulatto grass silage and WBG (as top dress) on the productivity of sheep in the St. Kitts (in collaboration with Ross University) ;

• Evaluate the impact of the experimental diets on parasitic load and health condition of sheep (in collaboration with Ross University);
Way forward

• Continue building capacity in forage establishment and management. Possible adoption of technologies successful in other countries of the region eg systems utilising Trichantera, Leucaena, Gliricidia, Mulberry

• Building strong farmers groups/association
Thank you,

SMALL RUMINANTS TEAM
J. Berry, I. Watts, R. Guishard, L. Henry, - DEPT. AGRICULTURE, St. Kitts
A. Hosein and N. Gibson, CARDI
S. Borucki and L. Phillip, McGill University

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