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

A Hosein[1], S Borucki[2], I Watts[3], J Berry[3] and L E Phillip[2]

[1]Caribbean Agricultural Research and Development Institute (CARDI), Trinidad and Tobago Unit;
[2]Animal Science Department, Faculty of Agricultural and Environmental Sciences, McGill University, Montreal, Canada;
[3]Department of Agriculture, Ministry of Agriculture, Marine Resources and Cooperatives, St. Kitts and Nevis.

CIFSRF - IDRC - DFATD- CARICOM Food Security Project

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

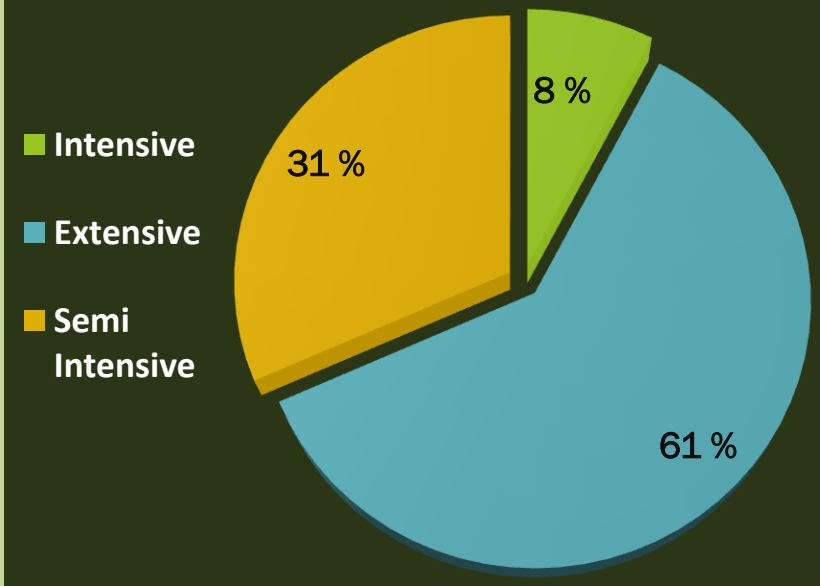
FRAMEWORK – St. Kitts and Nevis

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

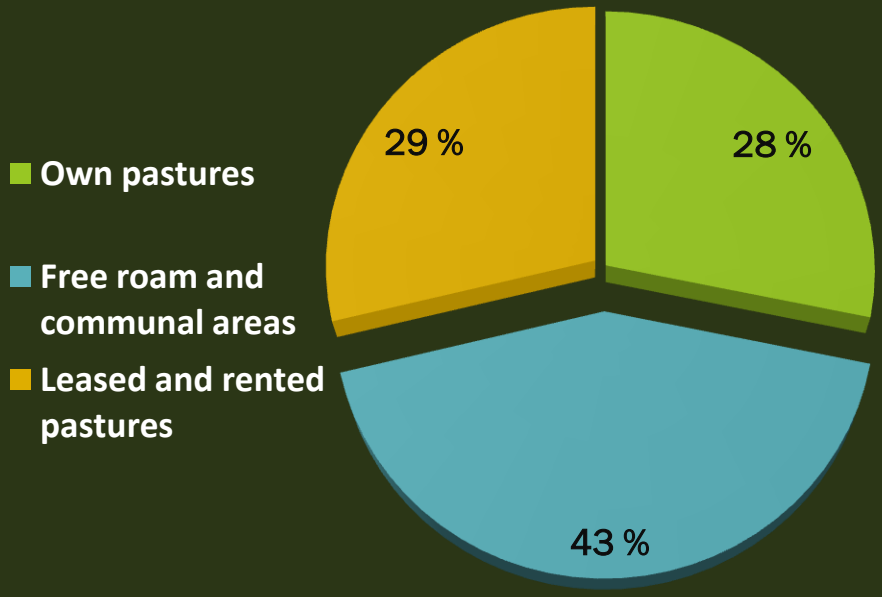
- CARICOM net importer
- Consumer demands

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


Weekly field observation


Measurements: ruler and quadrat


Sampling: quadrat

MATERIALS AND METHODS Forage Management

Agronomic decisions	Forage Sorghum		Mulato II
Variety	Brown mid-rib hybrid, Great Scott TX		Mulato II, Tropical Seeds FL
Area	2 hectares		2 hectares
Planting date and density	March 2nd 2012	November 2nd 2012	February 3rd 2012, April 19th 2012
	22 kg seed / ha	22 and 11 kg seed / ha	11 kg and 18 kg seeds / ha;
Fertilization	No pre-plant fertilization ; 227 kg/ha at 52 d NPK (15:15:15)	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)
Harvest	May 24, 2012	January 25, 2013	1st harvest: July 27, 2012 2nd harvest: November 15, 2012 Brush cut every 6 wk
Weed control	No pre-plant or growth stage weed control	pre-emergent herbicide and post emergent broad leaf control	No pre-plant or growth stage weed control (only re-seeded section); Post emergent broad leaf control

Dry season MULATO II establishment

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 ichlorophenoxyacetic 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

FORAGE
(mulato and forage sorghum)

Forage establishment - (quadrat method)
(height, soil coverage, # tillers, weeds)

Plant maturity: physiological state

Weed development (area covered, type)

Kg of biomass produced (quadrat method)

Silage
(mulato and forage sorghum)

Kg forage ensiled

Successful storage, post harvest losses (Kg spoiled forage)

Monthly pH

Environmental:

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

Results

Results

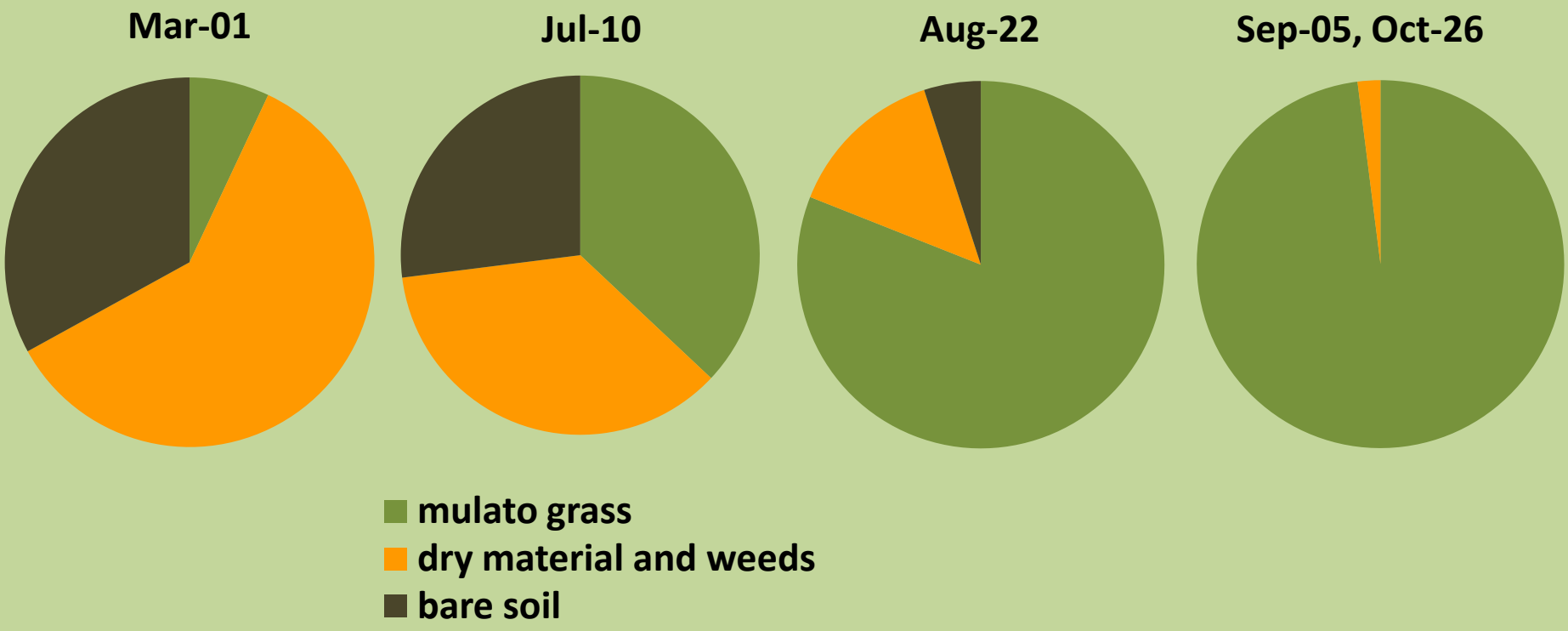
Soil cover (%)

Plant height

Biomass yield

RESULTS ESTABLISHMENT OF Mulato grass

% of area covered by mulato grass along the year



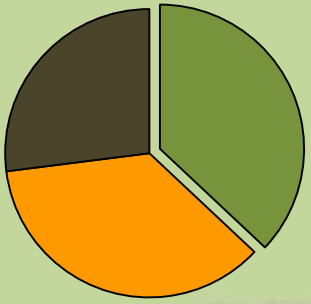
RESULTS

Mulato II establishment

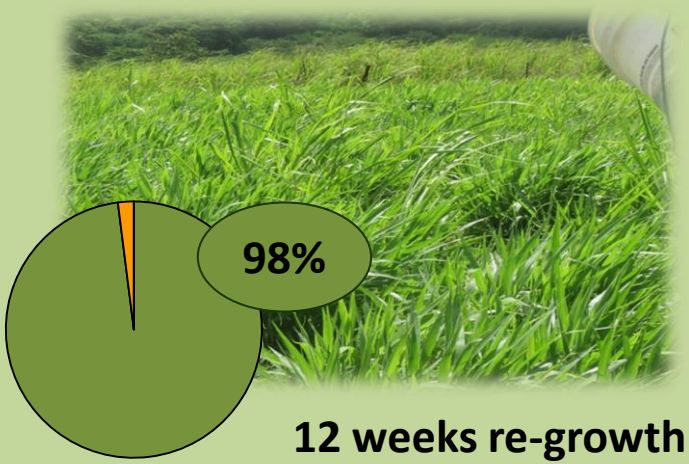
Area covered %

- mulato grass
- dry material and weeds
- bare soil

4 weeks



5 weeks re-growth



12 weeks re-growth

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

4,783 kg/ha

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

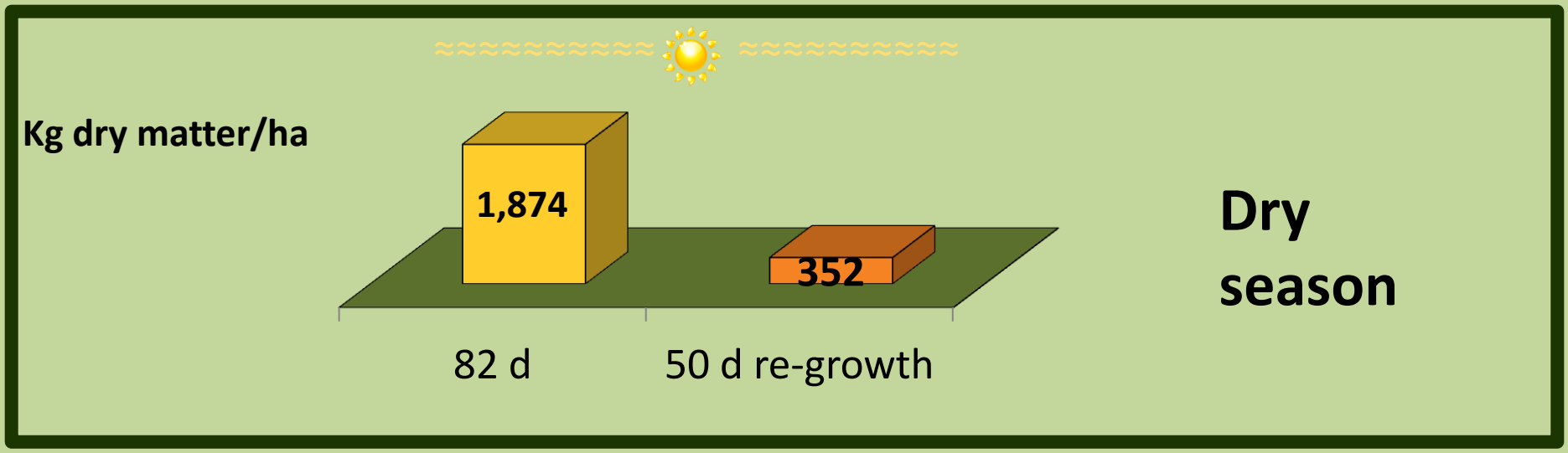
- seeded: beginning of rainy season
- 7 lb/acre; min 60% germ. rate
- 6 wk growth
- fertilized 178 lb/acre/ year
- herbicide: pre-emergent and contact herbicides

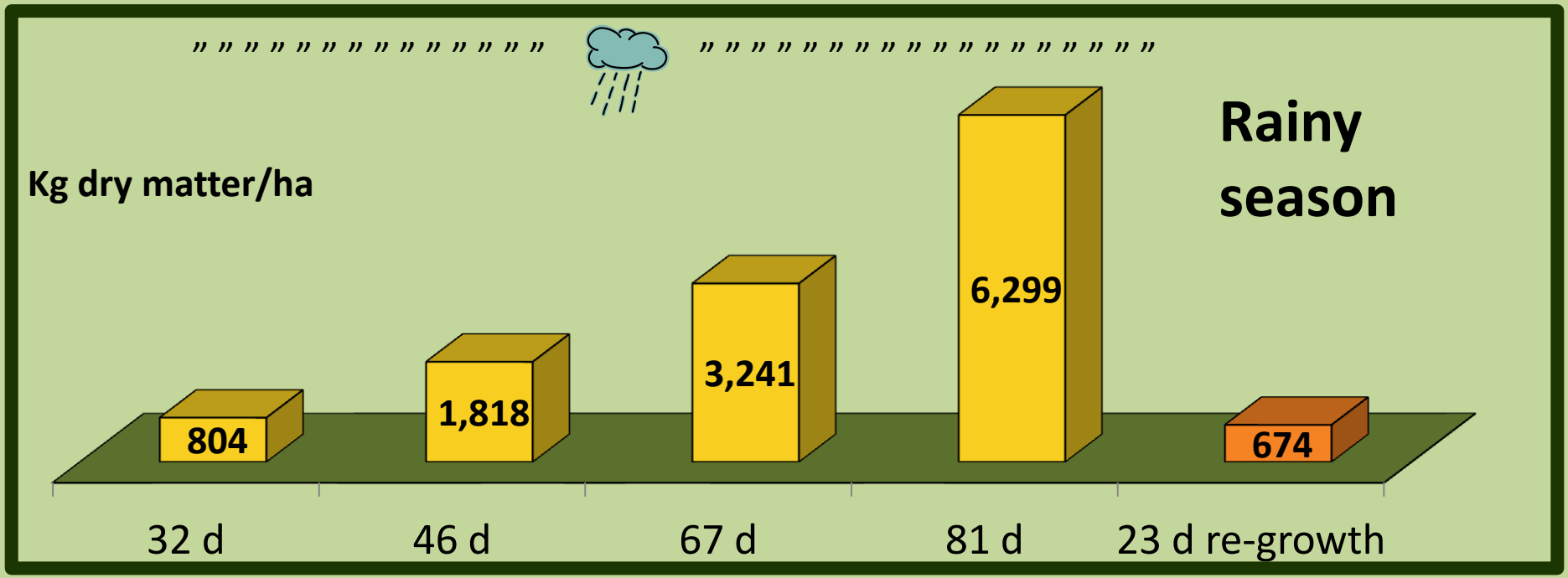
13,354 kg/ha

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

content/files/Highlights/TandT_highlights_2007-8.pdf

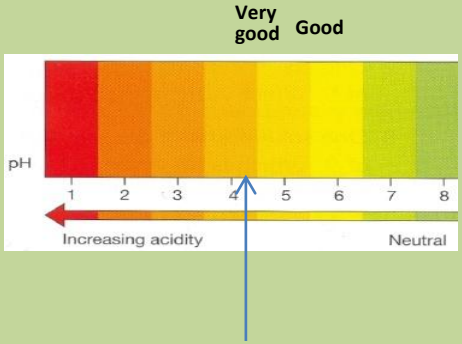
RESULTS BIOMASS Production Forage Sorghum





RESULTS Silage Production Forage Sorghum

Methodology : harvest, filling, compaction and storage



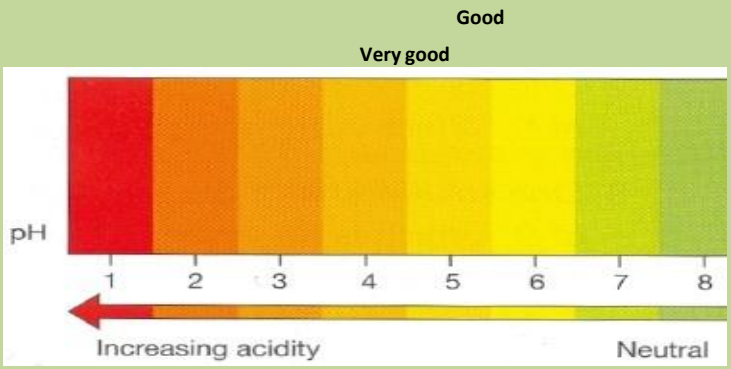
4.21 (6 weeks)

RESULTS Silage Production Mulato grass

Date of silage preparation	Date of Measurement	Days of conservation	pH	Conditions of preservation
July 27, 2012	September 20, 2012	1 month	5.64	acceptable
July 27, 2012	January 22,2013	6 months	4.47	very good
July 27, 2012	February 20, 2013	7 months	4.5	very good
November 10, 2012	January 22,2013	2 months	4.6	good
November 10, 2012	January 22,2013	2 months	4.95	good
February 2013	February 20, 2013	3 weeks	4.32	very good
February 2013	February 20, 2013	3 weeks	8.32	spoiled

RESULTS silage conservation

FORAGE SORGHUM silage, pH measurements				
Date of silage preparation	Date of Measurement	Days of silage conservation	pH	Conditions of preservation
May 24, 2012	July 10, 2012	1 month	4.21	very good
January 22, 2012	February 20, 2013	1 month	4.33	very good



RESULTS

Forage harvested and stored

FORAGES	Total established	Ensiled forage (kg)
Forage sorghum Cycle One Dry Season	2.0 has (5 acres)	23,595
Forage sorghum Cycle One Rainy Season	2.0 has (5 acres)	3,243
Mulato grass Dry Season	2.0 has (5 acres)	3,060
Mulato grass Rainy Season	2.0 has (5 acres)	6,050

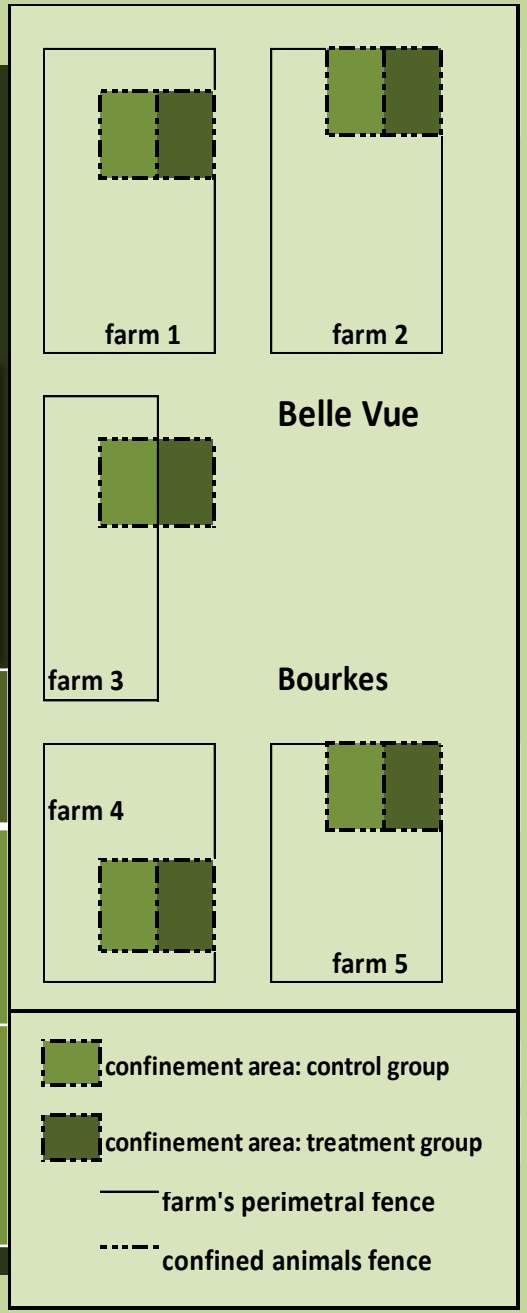
ANIMAL PERFORMANCE

Agricultural Diversification: Small Ruminants

Methodology:

Sites: Bourkes & Belle Vue

5 farms	DIETS	
5 animals	Control	Natural pasture (day)
5 animals	Treatment	Natural pasture (day) + Mulato Silage (night : 5pm to 8 am)



Agricultural Diversification: Small Ruminants

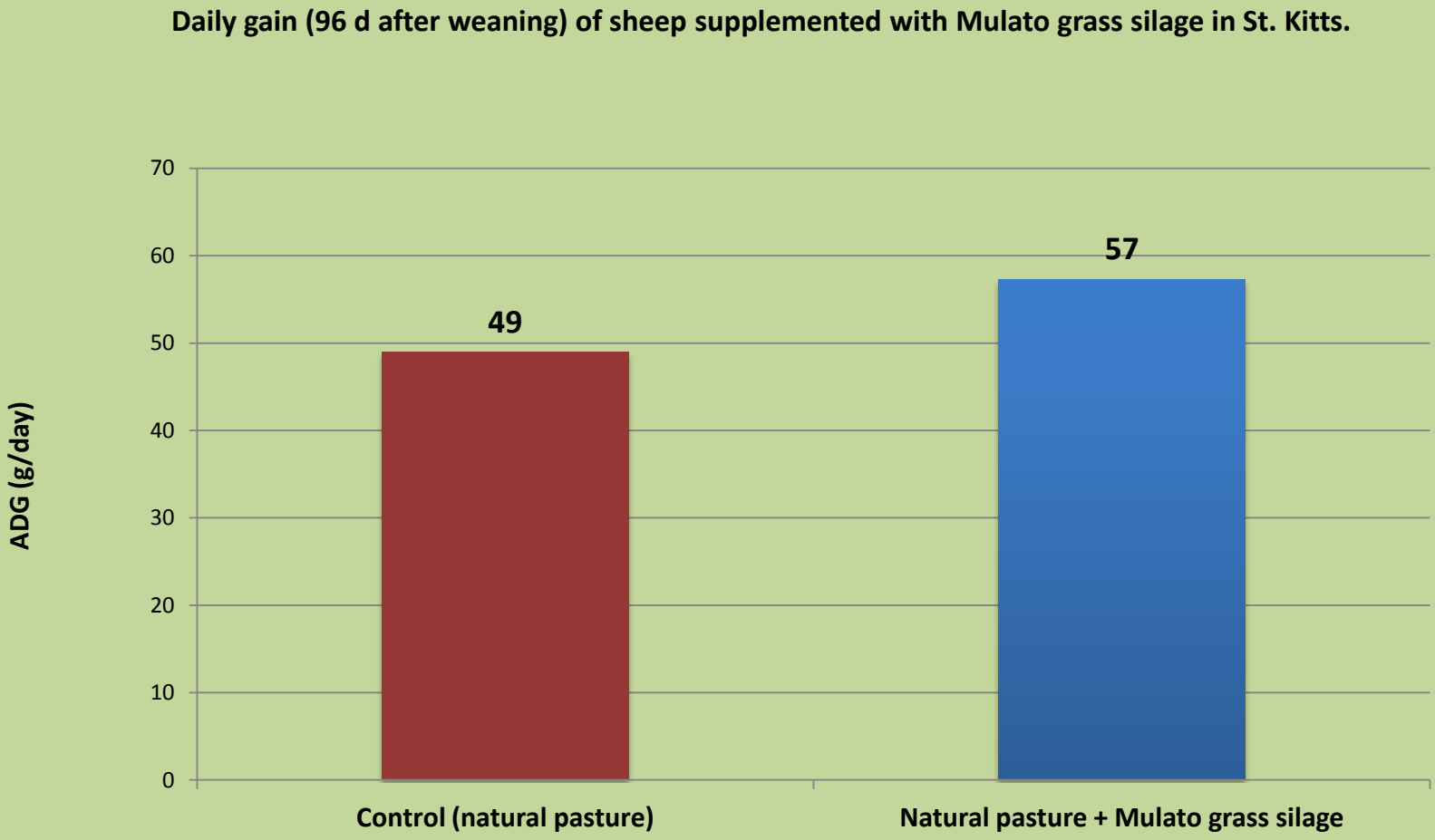
Measurements summary:

Live body weight, change

Consumption (offer - refused)

Average daily gain

RESULTS Animal Performance Studies



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

ACKNOWLEDGEMENTS

Canada's International Development Research Centre (IDRC) with the financial support of the Government of Canada provided Through the Department of Foreign Affairs, Trade and Development Canada (DFATD).