East Africa Dairy Development

In partnership with

HEIFER INTERNATIONAL | ILRI | TechnoServe | ABS | World Agroforestry Centre

SASHA Sweetpotato Action for Security and Health in Africa

SASHA: Animal feed feasibility study Rwanda and Kenya

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Sweetpotato as food and feed

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- Can easily be incorporated in smallholder farming systems –abundant suitable niches
- Vines and small roots and tubers unsuitable for human consumption are rich in protein
- Can be utilized with locally available feeds such as poor roughages to improve quality

Feed Type	DM Fraction	Crude Protein (g/ kg DM)
Napier grass	0.17	128
Dual Purpose Sweetpotato Vines	0.33	234

Project Objectives

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- Identify the appropriate adapted dual purpose and forage varieties for specific livestock production systems and specific agro ecologies
- Determine the most appropriate combination of sweetpotato vines/roots with other available feedstuffs that maximize livestock productivity and household incomes under the environmental and economic constraints in the project area
- Model and test novel feed and production and feeding strategies based on optimizing sweet potato legumes-other feed resources-pig and dairy interactions

Activities

- Activity 1: Screening sweet potato germplasm for biomass production under different cropping regimes and their potential as dual-purpose varieties
- Activity 2: Adapting simple, low-cost, silage-making techniques using sweet potato roots and vines, other feed resources and legumes.
- Activity 3: Modeling and testing novel feed production and feeding strategies based on optimizing sweet potato-legumes-other feed resources-pig and dairy interactions.

SASHA-EADD collaboration

- This activity is being implemented through a joint collaboration between two BMGF funded projects. Benefits include:
  - ✓ Leveraging on resources
  - ✓ Facilitates easier access to farmers
  - ✓ Interaction with farmers through on-farm research will enhance adoption of sweetpotato as food and feed

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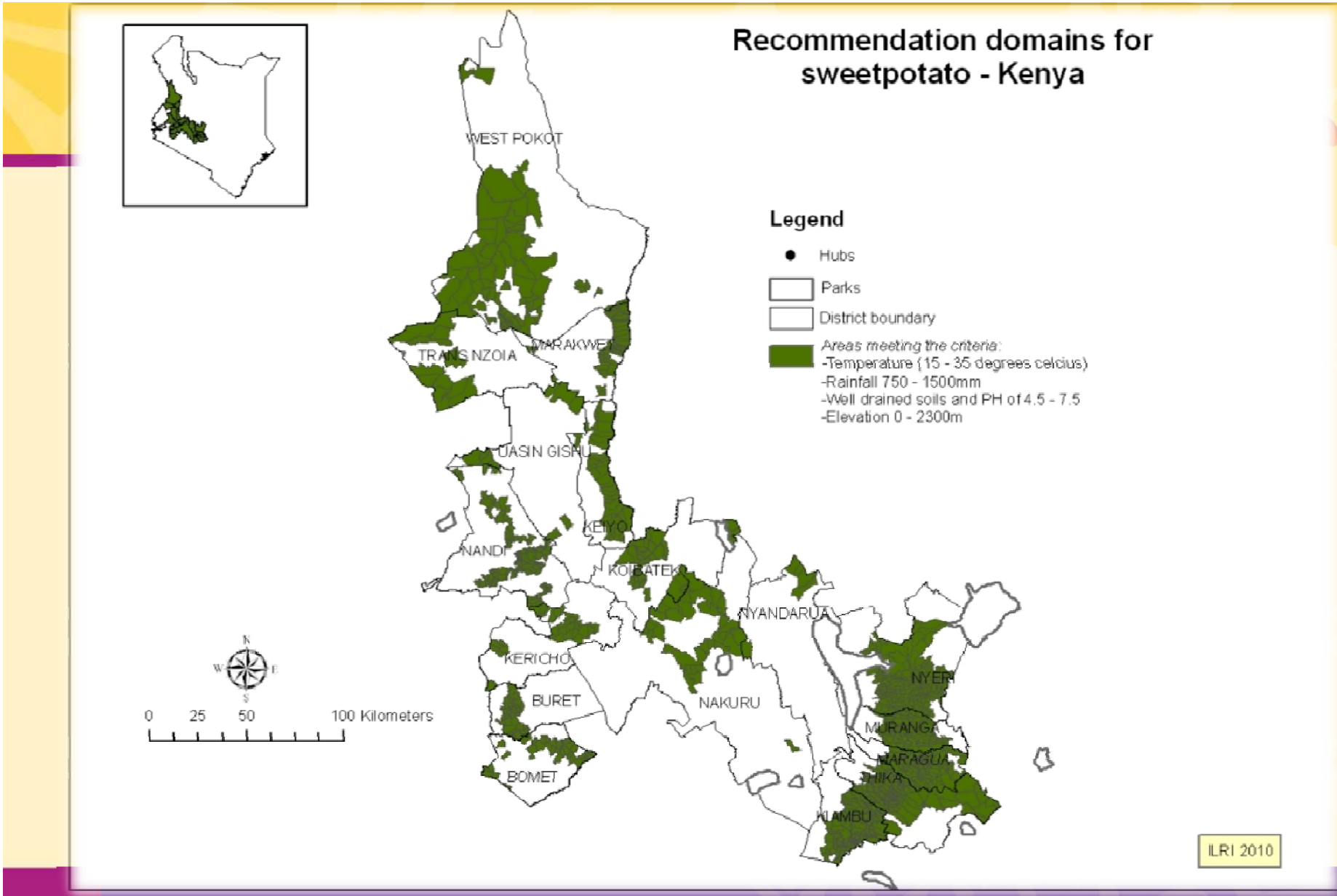
Activity 1

Screening sweetpotato germplasm for biomass production under different cropping regimes and their potential as dual-purpose varieties

Implementation process

- Engaged stakeholders – Kenya and Rwanda
- Determined recommendation domains
- Recruited four MSc. Students - implementing each of the activities
- Participatory screening with farmer groups – on going
- Participatory evaluation of varieties with farmers and cows
- Feed backs to farmers groups
- Results and lesson learned will be used to inform the up scaling process in the second year


Recommendation domains for sweetpotato - Kenya
WEST POKOT
TRANS NZOIA
MARAKWET
UASIN GISHU
KEIYO
NANDI
KOIBATEK
NYANDARUA
KERICHO
BURET
NAKURU
NYERI
MURANGA
BOMET
KIRINYAGA
KIAMBU
Legend
Hubs
Parks
District boundary
Areas meeting the criteria:
-Temperature (15 - 35 degrees celcius)
-Rainfall 750 - 1500mm
-Well drained soils and PH of 4.5 - 7.5
-Elevation 0 - 2300m
N
W
E
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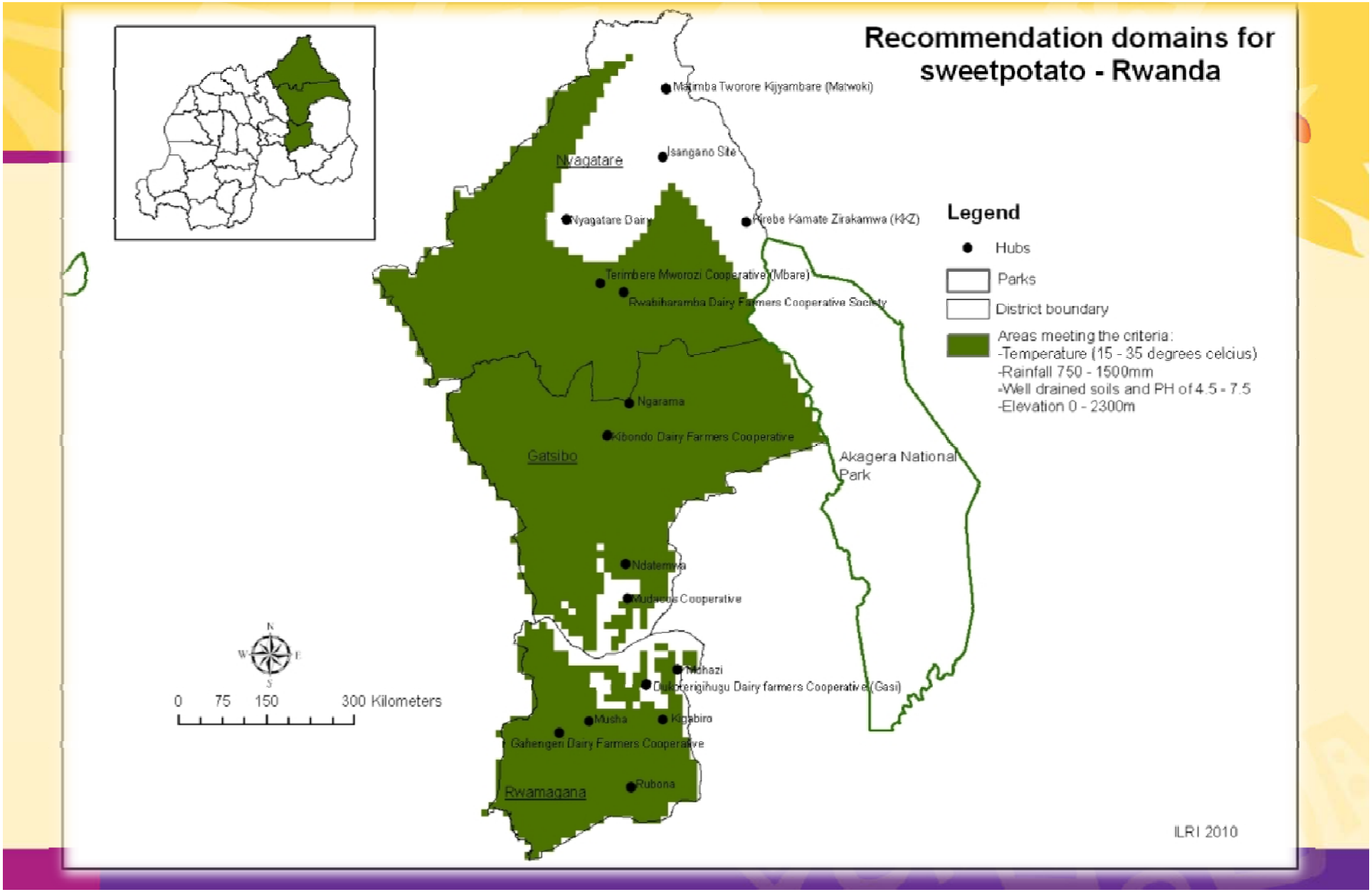
0 25 50 100 Kilometers
ILRI 2010


Recommendation domains for sweetpotato - Rwanda
Nyagatare
Gatsibo
Rwamagana
Akagera National Park
Legend
Hubs
Parks
District boundary
Areas meeting the criteria:
-Temperature (15 - 35 degrees celcius)
-Rainfall 750 - 1500mm
-Well drained soils and PH of 4.5 - 7.5
-Elevation 0 - 2300m
0 75 150 300 Kilometers
ILRI 2010

Screening design and parameters

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Design

- Comprised 6 sites x 6 varieties x 2 harvesting times.
- Harvesting regimes were:
  - 75days (vines only)
  - 150 days (vines and roots).

Parameters

- Total yield (forage and root)
- Nutritive value (proximate analysis)
- Climatic data (rainfall and temperature)
- Soils samples (N, P and K)
- Participatory farmer and cow preferences (150 days)

Study sites in Kenya

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District	Division	EADD Hub	Altitude	
			Medium (700-1200m asl)	High (1200-2300 m asl)
Nyeri	Kieni West	Mweiga		Mweiga (dry)
Bomet	Longisa	Longisa	Longisa (dry)	
Keiyo	Chepkorio	Chepkorio		Chepkorio (wet)
Nandi	Kabiyet	Kabiyet	Kabiyet (wet)	
Nandi	Kaptumo	Kaptumo	Kaptumo (wet)	
Buret	Konoin	Cheptalal		Cheptalal (wet)

Selected varieties - Kenya

Name	Foliage dry matter yield t/ha	Root dry matter yield t/ha	R/V ratio	Flesh colour	Classification
103001.152	1.58	4.00	2.53	Deep orange	H/dual purpose
Gweri	5.05	0.89	0.18	Intermediate Orange	Foliage
NASPOT-1	0.69	1.93	2.84	Yellow/cream	H/dual purpose
Wagabolige	1.54	4.21	2.73	Yellow/cream	H/dual purpose
Kemb 23 (local)	2.67	4.27	1.6	Cream	M/dual purpose
Kemb 36	2.18	2.62	1.2	Cream	L/ dual purpose

Major achievements

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- Stakeholder workshop held-attended by DFBA's (farmers), EADD staff (ILRI, ICRAF, Heifer Int.), Government extension, KARI, University of Nairobi, Egerton University and CIP
- Four Msc. Students recruited & registered with Egerton and Nairobi Universities
- Farmers groups and host farmers selected and sensitized
- Host farmers trained in a workshop

Stakeholder workshop participants in Kenya

Front row: Left to right

- Esther Karanja (EADD)
- Ben Lukuyu (EADD)
- Francis Nyaga (Farmers choice)
- Francis Ondambu (KARI)
- Charles Lusweti (KARI)
- James Kinyua (Egerton)
- Sylvia Wafula (EADD)
- Lonita Manoa (University of Nairobi)

Back row: Left to right

- Sammy Agili (CIP)
- Moses Ndathe (EADD)
- Levi Musalia (Egerton University)
- Patrick Mudavadi (EADD)
- Josephine Kirui (EADD)
- Prof. Charles Gachuiri (University of Nairobi

Vine yield (Ton/ha Fresh matter)

Cultivar	Agro ecological zone					Cultivar	S.E.D of means (Significance)	
	Mweiga	Longisa	Cheptalal	Kabiyet	Kabiyet		Main effects	Interaction (AEZ x Cultivar)
	Yield - Fresh Matter (Tons/ha)							
103001.152	0.01	2.1	0.01	2.4	0.9	0.93	0.75***	1.91***
Gweri	0.3	**3.5**	0.4	**5.9**	**4.6**	2.44		
Kemb 23	0.3	**4.0**	1.4	**11.1**	**6.3**	3.83		
Kemb 36	0.3	**5.5**	0.8	2.6	**5.3**	2.43		
Naspot	0.4	2.2	0.08	1.8	2.8	1.20		
Wagabolige	0.18	3.0	0.3	**11.7**	**6.7**	3.64		

Cost benefit analysis of sweetpotato production on a smallholder farm

TYPE OF FORAGE:		Sweetpotato production on a smalholder farm /year					
A	**COSTS (Ksh.)**	**Size of land (acres)**	**Man days**	**Unit cost**	**Total cost/ 0.13 acres**	**Total cost/ acre (Ksh)**	**Total cost/acre (US$)**
i	Costs of land preparation						
	Ploughing	0.13	4	150	600	4,800	62
	2nd Polughing	0.13	2	150	300	2,400	31
ii	Cost of planting						0
	Planting labour	0.13	5	150	750	6,000	77
iii	Costs of weeding						0
	1st weeding	0.13	10	150	1,500	12,000	154
	2nd weeding	0.13	5	150	750	6,000	77
iv	Cost of Ridging	0.13	0	0	-	-	0
	Ridging	0.13	2	150	300	2,400	31
v	Harvesting						0
	Cost of harvesting (tubers)	0.13	2	150	300	2,400	31
	Cost of harvesting (vines)	0.13	12	150	1,800	14,400	185
	Sub total				**6,300**	**36,000**	**462**
B	**BENEFITS (Ksh)**	**Size of land (acres)**	**Yield/ 0.13 acres**	**Unit price**	**Total value/ 0.13 cares**	**Total value/ acre (Ksh)**	**Total value/ acre (US$)**
i	Sweetpotato vines (number)	0.13	6000	1	6,000	48,000	615
ii	Sweetpotato roots (bags)	0.13	5	3500	17,500	140,000	1795
	Sub total				**23,500**	**188,000**	**2410**
	Grand total		**NPV**		**17,200**	**152,000**	**1949**

Activity 2

On station Screening of Sweetpotato Varieties and Silage Trial

Design

- Experimental design and treatments similar to the on-farm trials (except the sites)

Establishment

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Field preparation

Planting

Established vines

Harvesting Procedure (75days)

- **Vines cut using with knife leaving 20 cm stubble height (for re-growth)**
- **Vines placed in gunny bags and weighed**

Harvesting at 75 days

Ensiling Sweetpotato Vines

- Vines chopped to ≈ 0.5-1 cm using a chaff-cutter
- Vines pre-wilted to ≈ 40-50 % moisture content
- Vines weighed and mixed with respective treatment additives
- 500g vines ensiled in plastic bags silos - (12x18 inch)

Additives

TREATMENT	SPV	SALT	MOLASSES	CASSAVA FLOUR	MAIZE FLOUR	CHICKEN MANURE
SPV + SALT	3000g	15g				
SPV + MOLASSES	3000g	15g	60g			
SPV + CASSAVA	3000g	15g		150g	150g	
SPV + CHICKEN MANURE	3000g	15g				300g

Silos will be opened after 90 days

Ensiling vines process

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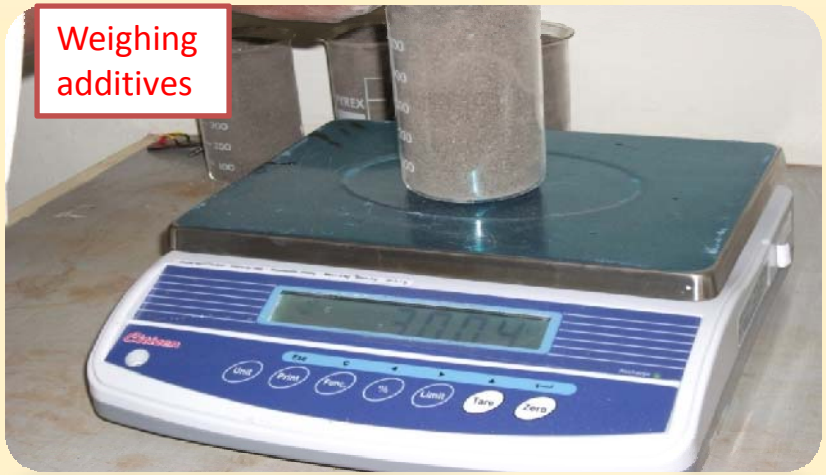
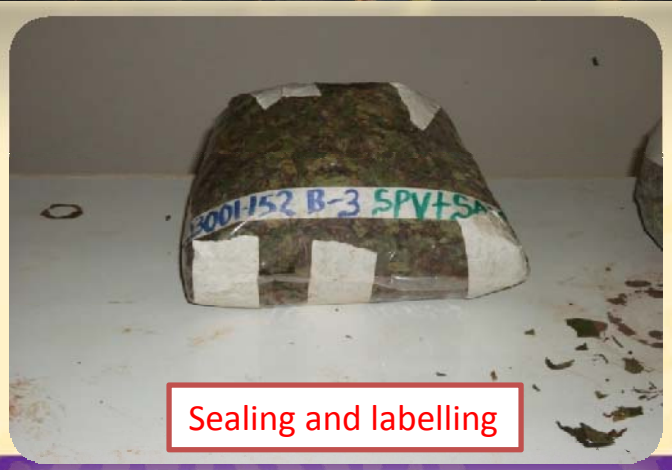


Weighing additives

Mixing additives with vines

Filling and compacting



Sealing and labelling

Harvesting of Vines and Roots (150 days)

- Cut whole vines and weigh in gunny bags
- All roots removed and soil removed with a brush
- All roots weighed
- Roots sorted into marketable and non marketable

Roots and vine harvesting

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Vines harvesting

Sorted roots

Roots harvesting

Weighing

Preparation of Silage at 150 days

- Silage treatments included (i) vines only and (ii) vines combined with roots (75:25%)
- Vines prepared as at 75 days
- Roots chopped into small pieces with knife

Treatments

TREATMENT (Vines: Root ratio on % basis)	SALT	MOLASSES	CASSAVA FLOUR	MAIZE FLOUR	CHICKEN MANURE
75:25 plus Salt	15g				
75:25 plus Molasses	15g	60g			
75:25 plus cassava	15g		150g		
75:25 plus maize				150g	
75:25 plus chicken manure	15g				300g

Opening of silos will be done after 90 days

Silage ingredients

Chopped vines


Chopped roots


Dried Chicken manure +roots


Silos

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PRELIMINARY RESULTS

Sweetpotato vine yield (tons DM/ ha)

Cultivar	Harvesting stage (days post planting)		Cultivar (C)	Harvesting stage (HS)		S.E.D of means for main effects (significance)		S.E.D of means interaction (significance)
	75	150		75	150	C	HS	Interaction (C X HS)
103001.152	2.0	1.7	1.9	3.9	5.4	0.37***	0.21***	0.52
Gweri	5.2	7.2	6.2					
Kemb 23	4.7	6.8	5.7					
Musinyamu	4.7	6.9	5.8					
Naspot 1	3.4	4.2	3.8					
Wagabolige	3.4	5.4	4.4					

Roots yield (tons DM/ ha)

Cultivar	Harvesting stage (days post planting)		Cultivar (C)	Harvesting stage (HS)		S.E.D of means for main effects (significance)		S.E.D of means interaction (significance)
	75	150		75	150	C	HS	Interaction (C X HS)
103001.152	2.4	3.9	3.1	2.3	3.9	0.36***	0.21***	0.52*
Gweri	1.0	1.4	1.2					
Kemb 23	2.4	4.8	3.6					
Musinyamu	2.6	2.7	2.6					
Naspot 1	3.6	7.1	5.4					
Wagabolige	2.0	3.8	2.9					

Root: Vine ratios

Cultivar	Harvesting stage (days post planting)		Cultivar (C)	Harvesting stage (HS)		S.E.D of means for main effects (significance)		S.E.D of means interaction (significance)
	75	150		75	150	C	HS	Interaction (C X HS)
103001.152	1.2	2.3	1.8	0.7	1.0	0.13***	0.07	0.18
Gweri	0.2	0.2	0.2					
Kemb 23	0.5	0.7	0.6					
Musinyamu	0.5	0.4	0.5					
Naspot 1	1.2	1.7	0.5					
Wagabolige	0.7	0.7	0.7					

Year II – Kenya activities

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- Analysis of the clone evaluation trials. Determine the two clones with better performance.
- Validation of selected clones and test at least one clone from orange flesh group
- Evaluation of a new form of silage drainage by using the “tube & plastic tank silage”
- Determine the appropriate level of combination of Napier grass and sweet potato vines
- Determine the appropriate level of combination of sweet potato and maize stover (haylage)
- Determine the appropriate level of combination of sweet potato vines and roots
- Determine the scenarios of SP use (fresh and silage) in combination with local feeds
- Prepare the leaflet on SP silage

Year II - Activities

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- Replicate Activity 1 in Rwanda drawing from lessons learned in Kenya
  - Include root testing by humans
- Initiate activity 3 in Kenya - Modeling and testing feeding strategies in pig and dairy systems
  - LIFE_SIM trained held in Nairobi in August 2010


Simulation models to asses year-round feeding strategies in
smallholder crop-livestock systems;
incorporation of sweet potato into animal feeds
LIFESIM training workshop; August 24-26, 2010; ILRI Campus, Kenya
International Potato Center, CIP – SASHA / Africa

Preliminary conclusions

- Local and introduced varieties are showing similar performance so far.
- More DM yield (vines & roots) was achieved at 150 day harvest

Lessons learned – On farm

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- A great interest in sweetpotato trials in north and south rift valley sites
- There seems to be a correlation between varieties and Agro ecological zones
- A huge demand for sweetpotato planting materials

Lessons learned – Silage trial

- Need to deal with high moisture content of sweetpotato vines
- Need to incorporate a drainage systems in the silo for sweetpotato vines when not in a position to wilt

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The End.

Thank you for your attention