

Transforming potato & sweetpotato
value chains for food and nutrition
security

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DEVELOPMENT OF DUAL-PURPOSE SWEETPOTATO VARIETIES THROUGH PARTICIPATORY BREEDING IN RWANDA

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Outline

- i. Introduction
- ii. Materials and Methods
- iii. Results
- iv. Discussion
- v. Conclusion and recommendations

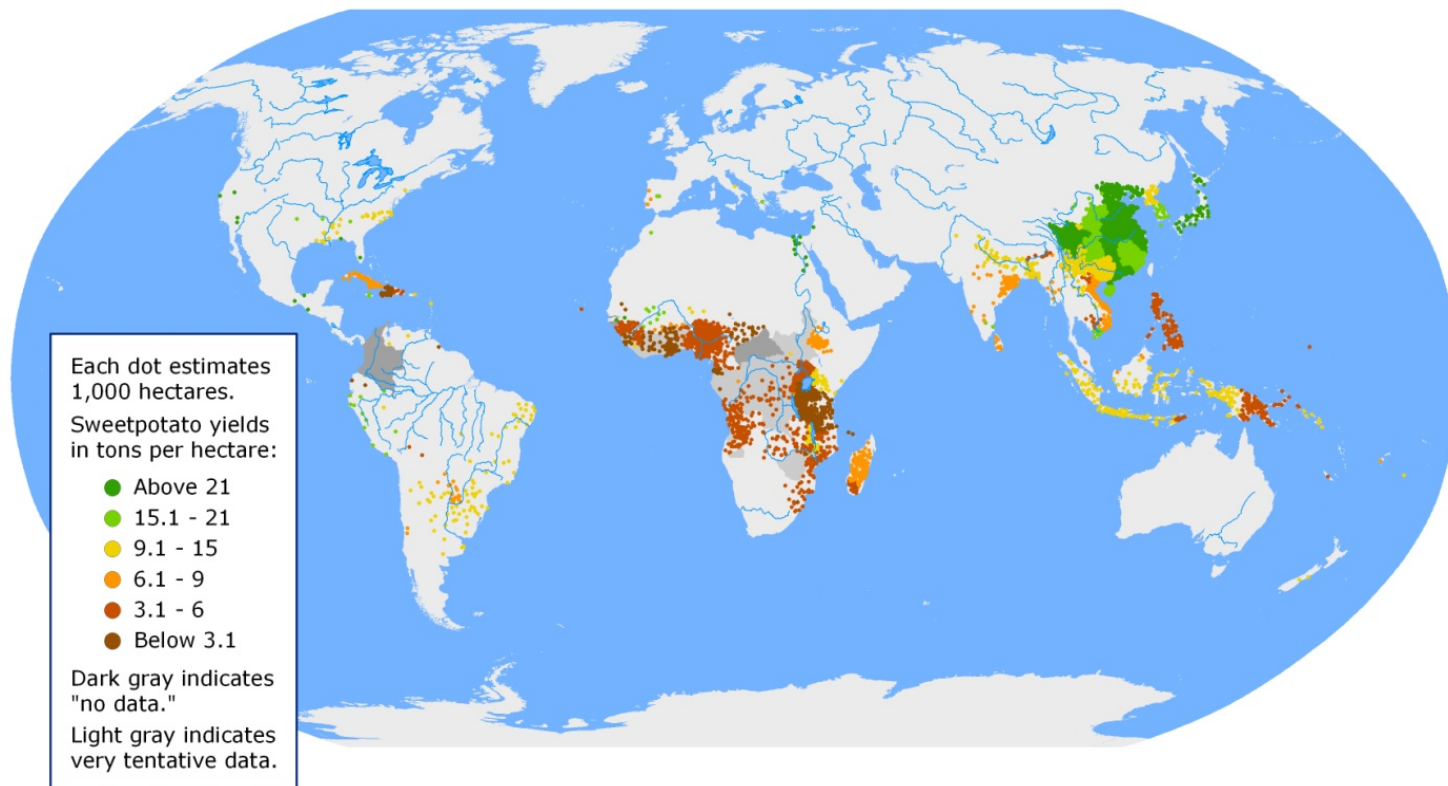




Global sweetpotato cultivation

Sweetpotato Production

Areas of Cultivation and Average Yields



Source:

<https://research.cip.cgiar.org/confluence/display/WSA/Global+Sweetpotato+Cultivation>





Overall breeding objective in Rwanda

Overall breeding objective:

To develop sweetpotato varieties
 with:

- ❑ High fresh root yield and vines (dual-purpose)
- ❑ Quality traits (mainly DMC, B-carotene)
- ❑ Tolerant to pests and diseases
- ❑ Suitable for specific or wide adaptation, farmer preferred)



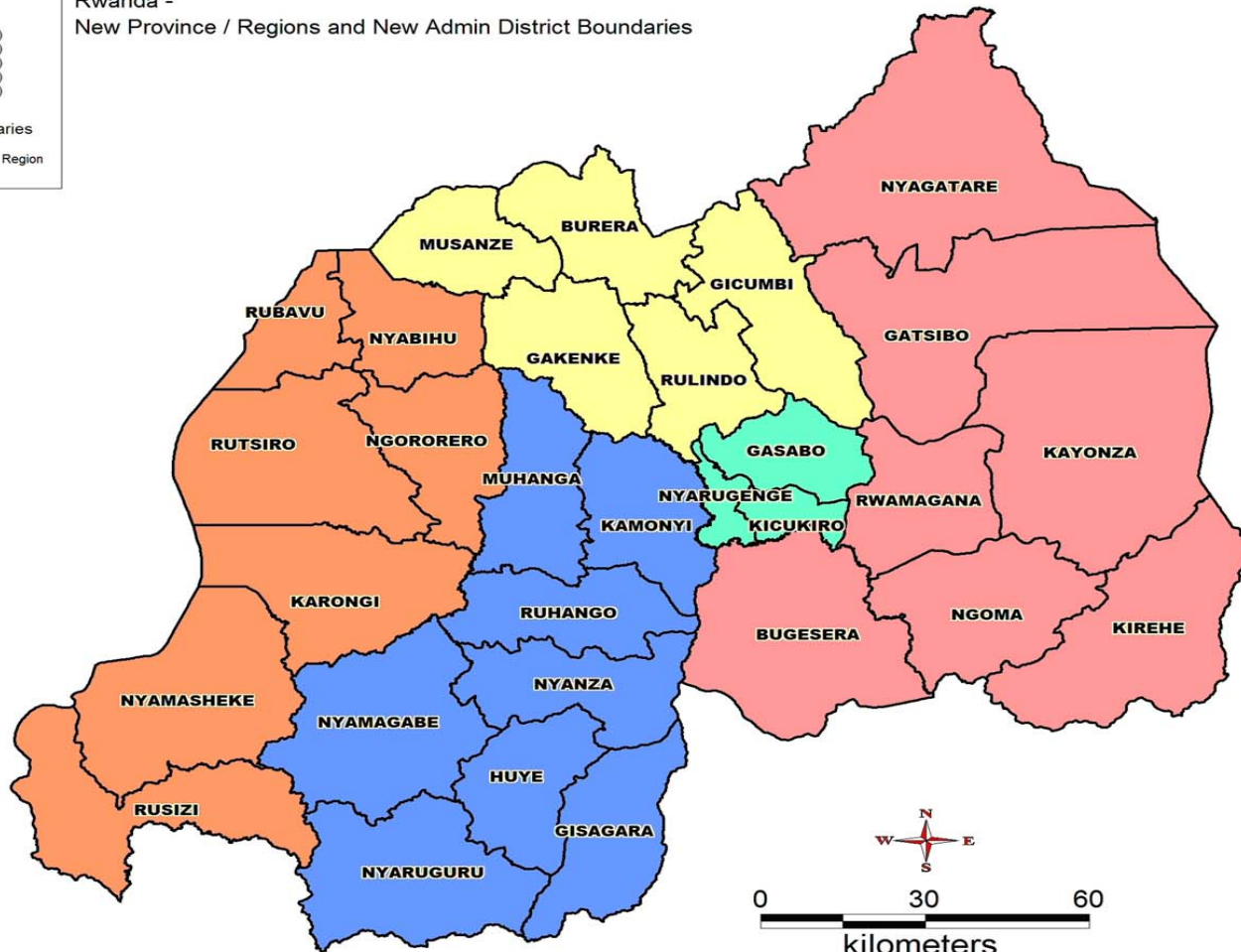


Targeted areas

Province / Region	
EST	(1)
NORD	(1)
OUEST	(1)
SUD	(1)
VILLE DE KIGALI	(1)

New District Boundaries	
	New District Region

Rwanda -
 New Province / Regions and New Admin District Boundaries

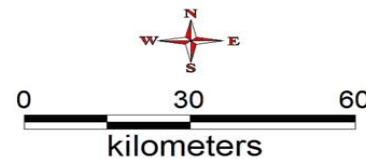


Targetted areas are low, mid and high altitudes of Rwanda

Low altitude:
 Bugesera and Ngoma Districts

Mid-Altitude:
 Huye, Muhanga Districts

High altitude:
 Rulindo and Gakenke Districts





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Objectives of this research

❑ Overall objective:

- Develop through participatory and accelerated breeding, sweetpotato varieties with high yield for both fresh roots and vines, suitable to be used as dual-purpose use

❑ Specific objectives

- Select high yielding, high dry matter and high Beta-carotene content clones
- Conduct on-farm participatory selection with farmers for clones with farmer preferred characteristics





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Research sites and Germplasm

Site	Location	Characteristics
Rubona	South Rwanda	Mid-altitude, low SPVD pressure
Karama	East Rwanda	Low altitude, semi-arid, high SPVD pressure
Ngoma	East Rwanda	Low altitude, medium SPVD pressure

Germplasm	Important traits
1. Thirty high yielding clones recorded by farmers as “elites”	High DMC, farmer-preferred
2. Thirty sweetpotato improved parents	High root yield, high Beta-carotene, low DMC



Crosses

- ❑ Germplasm: 154 families
- ❑ A crossing block with 60 parents was established at Rubona. The 60 parents were crossed in a factorial controlled cross design [6 male parents (3 WFSP and 3 OFSP) x 54 female parents]





Field experiments

- ❑ 5,380 well-established genotypes entered OT
- ❑ 268 were selected and advanced in PT, through PVS
- ❑ 25 best clones were selected and entered advanced breeding clones trials





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Field experiments (cont'd)

- ❖ On-farm trial conducted in 3 main growing areas
- ❖ 10 promising varieties for dual purpose use planted on-farm (5 varieties+ 1 local check for each farmer)
- ❖ In total 42 farmers handling on-farm trials (High altitude: 12, Mid-altitude: 15; Low alt & semi-arid: 15)





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Results





Performance of sweetpotato clones across 3 locations Rubona, Karama and Ngoma, 2013 A

Clone	MRW (kg)	MRN	Root yield (t/ha)	V V (score 1-9)	VW (kg)	SPVD (score 1-9)	Alternari a (score 1-9)
RW11-17	7.1	29.8	21.6	5.9	15.4	1.3	1.0
RW11-1860	6.8	29.0	20.9	5.2	12.2	2.2	1.0
RW11-2419	5.6	21.5	20.3	5.8	11.7	2.8	1.3
RW11-2560	8.1	24.8	22.2	4.8	11.9	2.2	1.0
RW11-2910	5.8	17.8	20.4	4.2	12.5	2.5	2.0
RW11-4923	5.9	24.5	19.0	4.7	14.2	2.0	1.0
CV (%)	19.2	32.0	16.1	16.7	32.0	35.6	36.3
LSD _{0.05}	6.9	6.5	6.0	1.7	6.7	1.7	1.0

MRW: Marketable root weight, MRN: marketable root number, VV: vine vigor, VW: vine weight



Performance of selected clones in on-farm trials in Rwanda, 2012 B season

Clone	MRW (kg)	MRN	Root yield (t/ha)	SPVD	Altern aria	Vine weight (kg)
RW11-17	3.3	20.5	12.9	2.5	1.0	13.1
RW11-1860	4.7	25.5	9.8	2.0	1.0	2.6
RW11-2419	7.2	40.0	18.7	2.5	1.0	5.3
RW11-2560	2.5	12.5	13.4	1.5	1.0	2.3
RW11-2910	3.9	27.5	8.3	2.0	1.0	3.1
RW11-4923	3.3	17.0	9.1	2.0	1.0	4.0
Check Kwezi	2.5	21.0	6.9	1.0	1.0	2.5
CV (%)	35.1	30.7	24.5	9.2	0.1	35.7
LSD _{0.05}	4.4	31.9	6.7	1.2	0.1	7.3



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Quality attributes of the 6 released varieties

Attribute	Variety						Local check
	RW11-17	RW11-1860	RW11-2419	RW11-2560	RW11-2910	RW11-4923	
DMC roots (%)	30.8	37.8	24.9	21.0	31.1	37.3	30.0
DMC vines (%)	17.0	20.7	17.6	20.6	18.3	19.2	18.0
DMY roots (T/ha)	8.3	9.5	6.3	5.4	7.9	9.4	5.4
DMY of vines (T/ha)	4.1	4.8	3.4	2.7	3.9	4.5	2.6
Ratio (R/V)	2.0*	1.9*	1.9*	2.0*	2.0*	2.0*	2.1

DMC: dry matter content; DMY: dry matter yield; R/V: root to vine ratio;

*: high dual purpose variety (R/V ranging from 1.5 to 2.0)



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Pedigree of the 6 released varieties

Official name	Farmers' name	Pedigree	Flesh color
RW11-17	Maryoha	Ejumula (open-pollinated)	White
RW11-1860	Giramata	2000-203 (open-pollinated)	White
RW11-2419	Izihirwe	Mugande (Open-pollinated)	White
RW11-2560	Terimbere	SPK004 (open-pollinated)	Deep orange
RW11-2910	Ndamirabana	Gihingumukungu (open-pollinated)	Light orange
RW11-4923	Mbakungahaze	Ukerewe (open-pollinated)	White



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Discussions

- CV for MRW (35.1 %) and vine weight (CV=35.7) were generally high
- ✓ Large plot-to-plot variability
- The six varieties with ratio R/V were released





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Discussions (cont'd)

- Based on the ratio R / V (1.5-2.0), six released varieties RW11-17, RW11-1860, RW11-2419, RW11-2560, RW11-2910, RW11-4923 were suitable for dual-purpose use
- Among the 6 released varieties, 2 of them were OFSP: RW11-2910, RW11-2560





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Conclusions and recommendations

- The new varieties can be helpful to farmers operating in mixed crop-livestock systems by using vines as animal feed
- These varieties can play a role of both food and feed, especially in areas where land availability is a constraint
- **Recommended additional research:** To assess cattle preferences and digestibility of forage/ vines for new varieties



Acknowledgements



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Thank you

