

Agronomic and organoleptic performance of organically produced provitamin A rich bananas for introduction into farming and diet systems of Burundi and Democratic Republic of Congo

Ekesa Beatrice, Simbare Alice, Kamira Muller, Sivirihauma Charles, Shimwela Mpoki, Nabuumma Deborah

Contact: b.ekesa@cgiar.org



Introduction

- Bananas are a major part of the diet systems of populations in Burundi and DRC
- VAD levels are higher than the acceptable WHO threshold of 15%
- Banana provide a viable entry point for addressing VAD



Study Sites

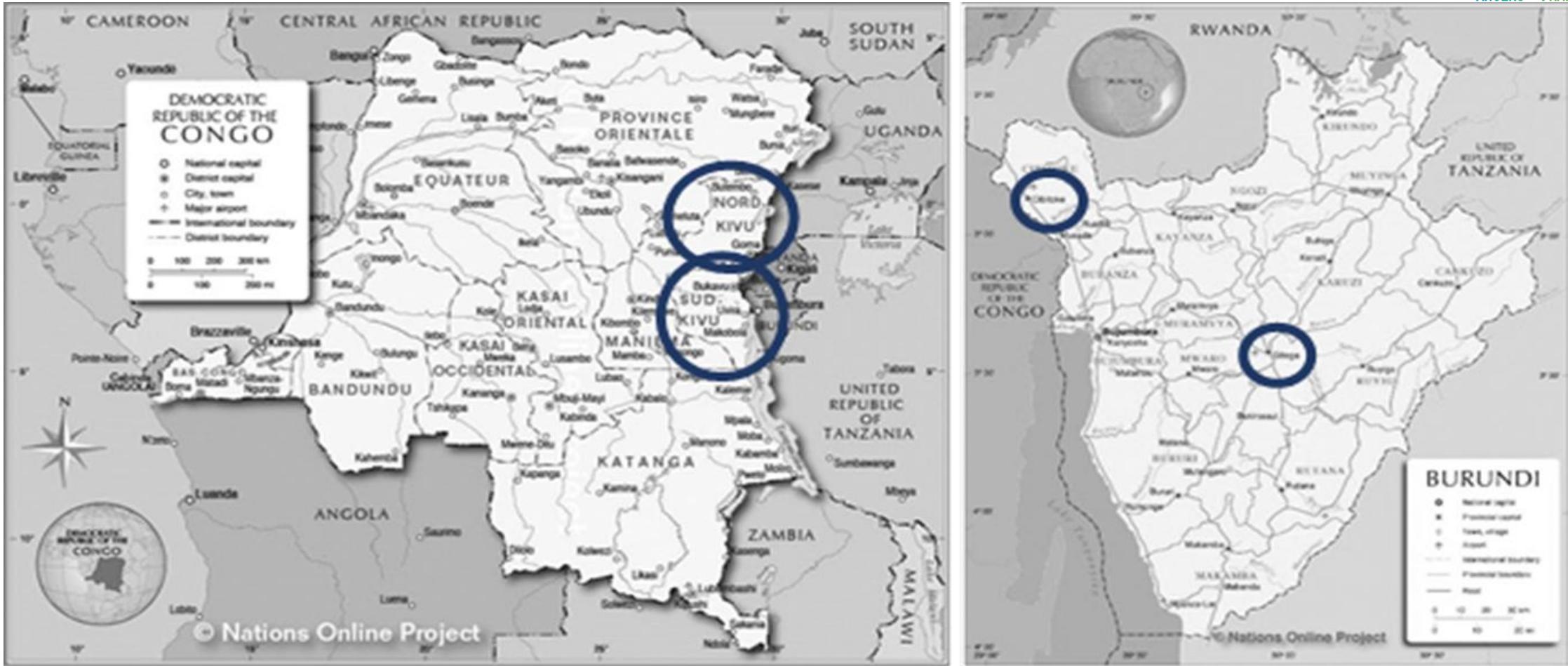


Figure 1 Map of DRC (South Kivu: Mulungu, Mushweshwe and Burhale; North Kivu: Maboya, Butembo and Mavivi) and Burundi sites (Cibitoke and Gitega) [24,25]

Study site & Varieties under evaluation

Burundi

- Sites:
 - Cibitoke 2011 (altitude 925m)
 - Gitega 2011 (altitude 1545m)
- Local Cultivars: Karamamasenge (AB-Dessert), Igisahira (AAA-EAHB), Muzuzu (AAB-Plantain)

North Kivu, DRC (2017: activities on hold in all sites due to unrest)

- Sites:
 - Maboya 2011 (altitude 1412m)
 - Butembo 2011 (altitude 1814m)
 - Mavivi 2011 (altitude 1066)
 - Suspended 2017 (due to civil unrest)
- Local cultivars: Musilongo (AAB-Plantain), Kitika sukari (AAA-Cavendish), Vulambya (AAA-EAHB)

South Kivu, DRC

- Sites:
 - Mulungu/Inera 2011 (altitude 1707m)
 - Burhale (altitude 1647m)
 - Mushweshwe (altitude 1528m)
 - Dropped in 2017 as same agro-ecological zone as Burhale
- Local cultivars: Gros Michel (AAA-Dessert), Barhebesha (AAA-EAHB), Musheba (AAB-Plantain)

 Trial design:

- Randomised Block design
- 3 blocks
- 5 replicates
- 6 vitamin A rich cultivars
- 3 local cultivars

PVAC-rich Cultivars

1	Apantu	AAB	Plantain	Cooking	Ghana
2	Bira	AAB	Pacific	Cooking	PNG
3	To'o	AA	Plantain	Dessert	PNG
4	Lahi	AAB	nd	Pacific	Hawaii
5	Pelipita	ABB	Plantain	Cooking	The Philippines
6	Lai	AAA	Red	Dessert	Thailand

The trials



Agronomic practices applied



Crop cycle duration of pVAC-rich banana across sites

		Burundi		North Kivu		South Kivu	
Cycles	Cultivars	Planting to Flower (Days)	Planting to Harvest (Days)	Planting to Flower (Days)	Planting to Harvest (Days)	Planting to Flowering (Days)	Planting to Harvest (Days)
C1	'Apantu'	409ba	528ba	475b	601b	485bc	616bdc
	'Bira'	339b	410c	403c	511c	550ba	646bac
	'Lahi'	346b	449bc	487b	587b	495bc	606dc
	'Lai'	474a	608a	660a	780a	569a	676ba
	'Pelipita'	411ba	545a	494b	607b	575a	701a
	'To'o'	465a	534a	402c	485c	459c	562d
C2	'Apantu'	766ba	878ba	934a	1049ba	942a	1063a
	'Bira'	675a	736b	789c	894c	818c	889b
	'Lahi'	351b	449c	785c	916c	924ba	1076a
	'Lai'	860a	970a	961a	1093a	948a	1078a
	'Pelipita'	658a	786ba	873b	994b	869bc	948b
	'To'o'	646a	707b	765c	874c	922ba	1049a
C3	'Apantu'	913a	1026a	1048c	1155c	1115ba	1218bc
	'Bira'	706b	814b	1013d	1086d	1068bc	1186c
	'Lahi'	-	-	1101b	1207b	1171a	1259a
	'Lai'	885a	1002a	1142a	1252a	1149a	1259a
	'Pelipita'	721b	842ba	1061c	1172c	1132a	1239ba
	'To'o'	788ba	853ba	1064c	1142c	1040c	1136d

Performance traits of pVAC-rich banana cultivars at harvest across sites

Sites	Cultivars	Number of Hands	Number of Fingers on Hand	Length of Finger	Total Number of fingers on bunch	Bunch weight (Kg)	Production (Tons/ha/ year)
South Kivu	'Apantu'	8b	11gef	22a	75b	18b	13cd
	'Bira'	6dc	13cbd	15gf	64c	9i	7g
	'Lahi'	9a	12cebd	15egf	111a	20a	15b
	'Lai'	6dc	13b	15egf	84b	17cb	11ed
	'Pelipita'	5fe	12cebd	17d	46fe	14feg	10ef
	'To'o'	4hg	13b	17d	31g	4j	3h
North Kivu	'Apantu'	5fe	12efd	22a	47fe	15ed	11ed
	'Bira'	6de	11gef	19c	60dc	13hg	10ef
	'Lahi'	6e	11g	20bc	56dce	14fheg	9ef
	'Lai'	5fg	11gf	21ba	51dfe	13fhg	8gf
	'Pelipita'	5fe	10gh	22a	46fe	13hg	10ef
	'To'o'	4h	10h	20bc	30g	4j	3h
Burundi	'Apantu'	7c	13cb	22a	82b	15fed	15b
	'Bira'	7c	12cebd	14g	75b	9i	10ef
	'Lahi'	9a	13b	16edf	113a	17cbd	23a
	'Lai'	5fe	14a	14gf	76b	12h	9ef
	'Pelipita'	7c	12cefd	17ed	80b	15ced	14cb
	'To'o'	4hg	12cebd	16egdf	44f	4j	4h

The pVACs bananas-Appearance



Apantu
cooking (AAB
Plantain)

Pelipita
Cooking (ABB
Plantain)

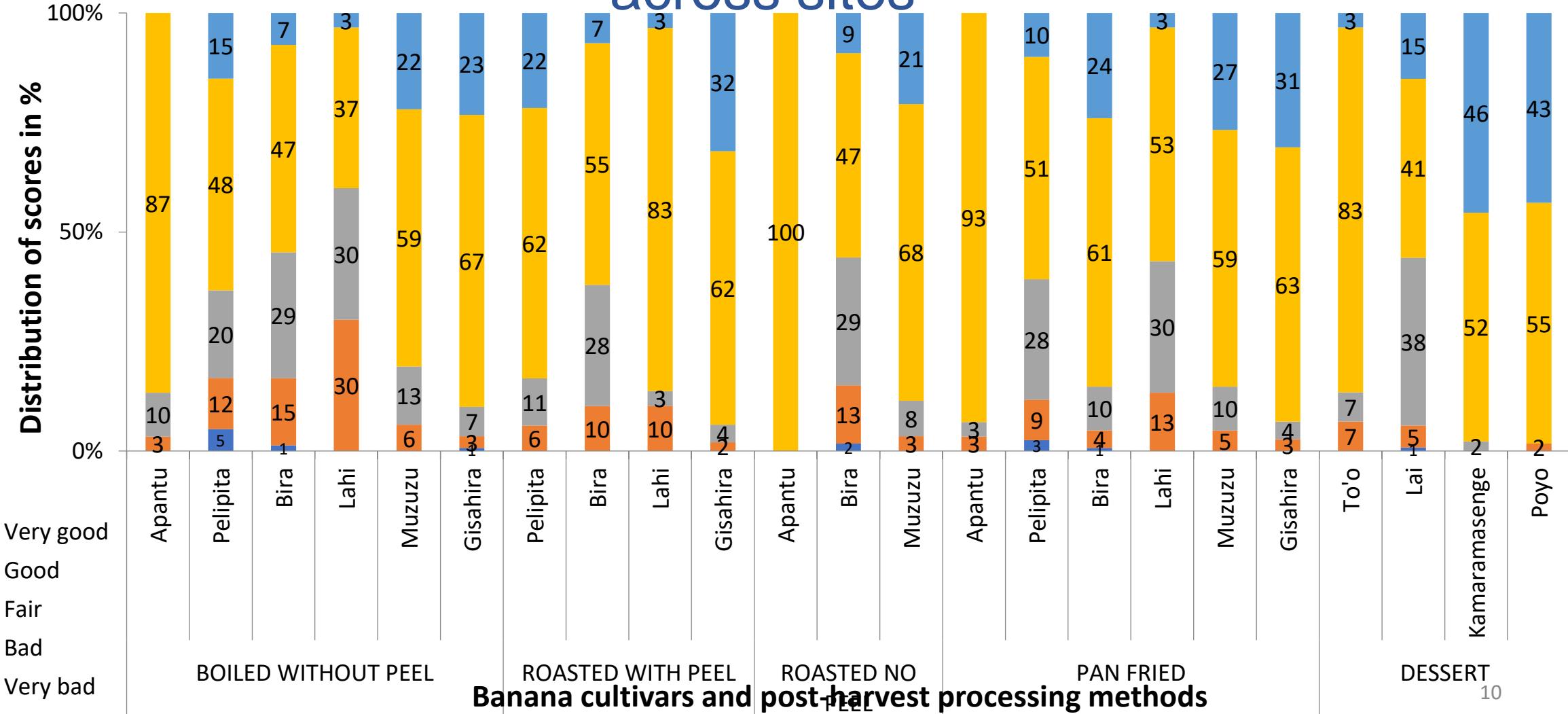
Lahi
Cooking (AAB
Pacific plantain)

Bira
Cooking (AAB
Pacific Plantain)

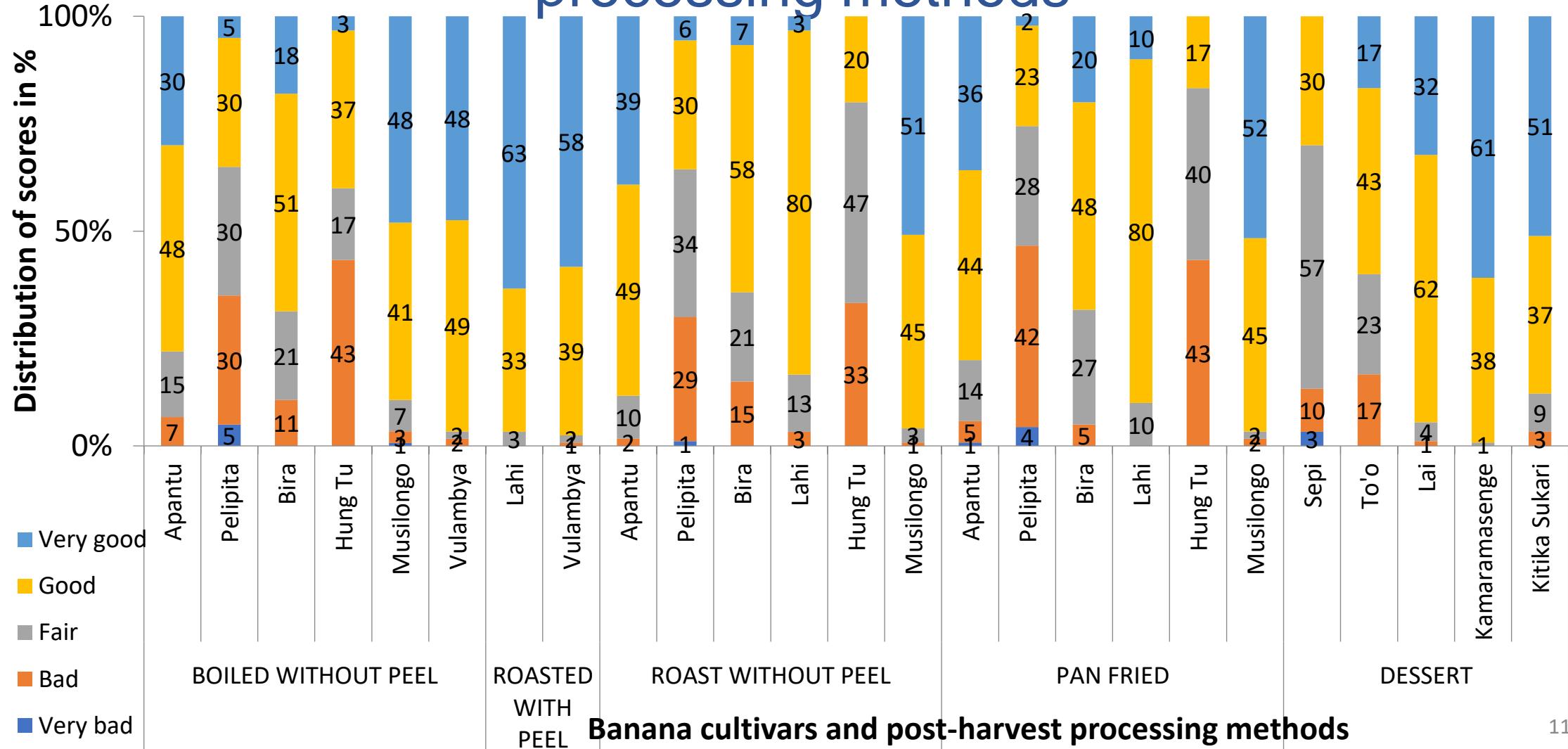
Lai
Dessert (AAA-
Desert banana)

To'o
Dessert (AAA-
Desert banana)

Performance traits of vitamin A bananas at harvesting and across sites



Overall evaluation scores based on different post-harvest processing methods



pVAC Values of the banana cultivars under evaluation

Accession	Ripening Stage	Total-pVACs	RAE µg/ 100g fw	% DRI child (<5 yrs) ^a		% DRI WRA ^a	
				Av 100G	Av 250g	Av 100g	Av 500g
Apantu	Stage 1	4680	322	84	201	46	230
	Stage 5	10056	687	172	429	98	490
Bira	Stage 1	4339	296	74	185	42	212
	Stage 5	10633	710	177	444	101	507
Lahi	Stage 1	3145	229	57	143	33	164
	Stage 5	10508	713	187	446	102	510
To'o	Stage 1	559	39	10	24	6	28
	Stage 5	7765	544	13603	340	78	389

pVAC: provitamin A carotenoids, RAE: retinol activity equivalent; DRI: dietary reference intakes

^aDRI: daily recommended intakes for children 1-5 years old is 400 RAE µg/day and for women is 700 RAE µg/day

Conclusions

- The most promising cultivars in terms of yield were 'Apantu-AAB', 'Lahi-AAB', 'Lai- AA', 'Bira-AAB' and 'Pelipita-ABB' across all sites and crop cycles.
- The most preferred banana cultivars organoleptically were Apantu, Bira, Lahi, Pelipita and To'o
- Farmers selected to have Apantu, Bira, Lahi, Pelipita and To'o in their farms
- Release of 5 varieties in Burundi
- All other varieties in the national germplasms in Burundi, Tanzania, Uganda and DRC



