Simple but Effective Sand Storage Technology for Assuring More Food and Timely Planting Material in Drought-Prone Areas of Sub-Saharan Africa

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SUMMARY

OFSP can significantly contribute to the fight against VAD in Sub-Saharan Africa. Erratic rainfalls, poor soil fertility, virus diseases, weevil incidence, and animal destruction are often experienced by OFSP farmers in drought-prone areas, disrupting crop production. There is a need for suitable "seed" systems that assure planting material access when farmers need to plant, to maximize yields. Farmers can also benefit from improved storage systems for table stocks, ideally up to the next harvest season. Between 2011 and 2018, studies were conducted in Northern Malawi and Ghana on a technique using sand to store fresh sweetpotato roots. Various types of sand, and some indigenous storage techniques were investigated. After storing for 4-6 months (depending on the location), the sprouted roots could be planted to produce vines for planting and unsprouted roots consumed or sold. Using the sand storage technique, vine producers generated income from vine sales and farmers had improved food security during hunger periods. They could sell roots to buy other food items or household needs. The technology provided producers with the flexibility to maintain and produce vines on demand, not restricted to the onset of the rains. Farmers realized market prices 100-300% higher for their stored roots compared to the peak harvest season, when prices are low due to glut. In conclusion, sand storage effectively helps reduce poverty, improve food and nutrition security and mitigate the effects of climate change.

INTRODUCTION

Vitamin A deficiency (VAD) is still a big problem in Sub-Saharan Africa. The orange-fleshed sweetpotato (OFSP) crop has been documented to significantly contribute to combat this VAD. Erratic rainfalls, poor soil fertility, virus diseases, weevil incidence, and animal destruction are often experienced by farmers in drought-prone areas. Sprouting in stores can contribute to rapid weight loss of roots (Chakraborty et al. (2017). All of these can disrupt crop production. Many sweetpotato farmers live in drought-prone areas and are often resource-poor. Food insecurity can be a problem. Lack of high quality planting material at the onset of rainy season is a major constraint to sweetpotato production. Storage in sand and sprouting technology recently introduced aims to extend the shelf-life of sweetpotato storage roots at room temperature. This is an innovative technology in the sweetpotato seed systems. Healthy and clean roots are kept in dry sand either in a basin (Namanda et al., 2013) or in a bigger container (Abidin, et al., 2016) for a few months during the dry season. At the start of the rainy season, good numbers of clean planting materials are readily available, while farmers also have fresh roots in their food stores during the hunger season. Sand storage scaling trials were conducted in Ghana between July 2017 and June 2018. This research built on findings from work initially done from 2011 to 2016 also in Malawi.

Fig.1. Bawku, Upper East Region, Ghana, 2017 (credit Erna Abidin)

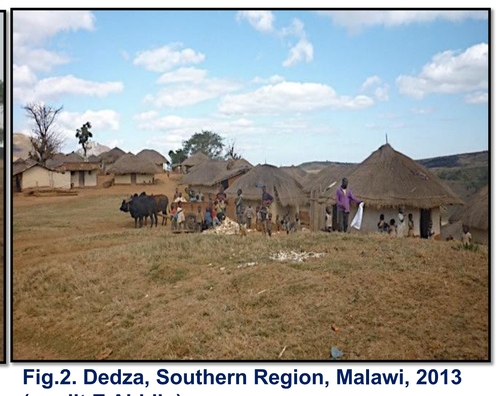

Fig.2. Dedza, Southern Region, Malawi, 2013 (credit E Abidin)

Fig.3. Soil crack and Weevil infestation, Ghana, 2017 (credit E Abidin & Daniel Akansake)

CONCLUSION

- **Sand storage** can be a powerful contributor to **food and nutrition security** in the face of climatic uncertainty. At the final discussion, participants (N = 382; 39%women) were happy and **wanted to use** the sand storage technology.
- This low cost technology could serve as a tool to encourage the involvement of youth in the agricultural sector. **29% youth** out of **384 registered** farmers participated in this community-based research.

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MATERIALS AND METHODS

Clean field with 'Good Agricultural Practices' to produce quality OFSP roots

SAND STORAGE – A LOW COST TECHNOLOGY

SAND FROM THE RIVER OR HOUSE-YARD

MEDIUM SIZE SAND

DRY AND COOL IT DOWN UNDER A TREE

Small container, i.e. basin kept in a room

Big container (volume: 0.45m³)

EACH BASIN: 50–60 SMALL SIZE ROOTS

SANDBOX IN A ROOM

STEPPED PIT IN THE HOUSE-YARD

EACH CAN ACCOMMODATE: 100 KG (n = ~ 340) MEDIUM SIZE ROOTS

RESULTS AND FINDINGS

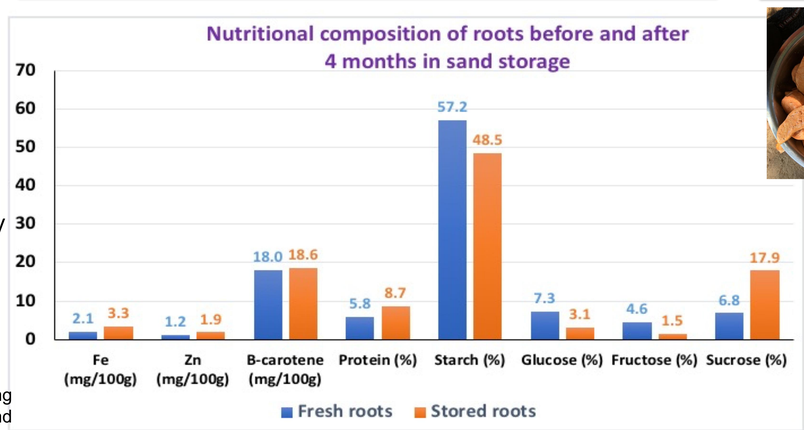
Region	Total yield - OFSP		Marketable roots - OFSP		Comments: GAP vs without GAP
	kg /180m²	ton/ha	kg/180m²	ton/ha	
Northern	328.6	18.3	213.6	12.1	Core farmers with GAP
Northern	205.8	11.5	115.8	6.5	Spillover farmers without GAP
Upper East	349.6	19.4	244	13.6	Core farmers with GAP
Upper East	207.8	11.4	146.8	8.2	Spillover farmers without GAP

GRAND TOTAL AT THE FINAL STAGE FOR SAND STORAGE TRIALS AFTER 4.5 MONTHS IN THE SAND STORAGE RECORDED FROM THE DROUGHT-PRONE AREAS IN GHANA

REGION	LOC	TREAT MENT & TYPE OF STORAGE	INITIAL ROOTS		ROOTS DAMAGED AND REMOVED					TOTAL THROWN AWAY AS WASTE				TOTAL ROOTS FOR FOOD		TOTAL ROOTS FOR PLANTING MATERIAL	
			#	Wt (Kg)	DISEASE	PEST	SHRINK	ROT	TOTAL	#	%	Weight (Kg)	% Weight	#	%	#	%
Northern	Golinga	Step pit	497	100	0	19	50	71	140	68	14	13.4	13	253	51	180	36
	Chirifoyoli	Step pit	531	100	3	9	51	110	173	76	14	14.2	14	248	47	208	39
	Gblahagu	Sand box	221	100	0	14	6	71	91	30	14	11.6	12	104	47	90	41
	Zoonayili	Sand box	212	100	3	54	12	48	117	45	21	18.5	19	97	46	75	35
Upper East	Abisiga	Step pit	265	91.1	0	0	11	172	183	136	51	40.0	44	66	25	58	22
	Barebare	Sand box	227	79	0	2	15	171	188	87	38	25.1	32	108	48	30	13
	Tampezua 1	Step pit	266	89.1	0	0	12	189	201	111	42	28.5	32	108	41	47	18
	Tampezua 2	Sand box	115	20.7	0	3	30	48	81	35	30	7.3	35	48	42	24	21
	Navrongo	Step pit	786	100.9	0	1	26	117	144	65	8	7.8	8	567	72	161	20
	Navrongo	Sand box	312	50.4	0	1	33	102	136	69	22	10.8	21	197	63	55	18
TOTAL	9	10	3,432	831	6	103	246	1,099	1,454	722	21	177	21	1,796	52	928	27

VERIFICATION ON FOOD: PREMIUM AND LESS QUALITY
AT THE FINAL STAGE FOR SAND STORAGE TRIALS AFTER 4.5 MONTHS IN THE SAND STORAGE RECORDED FROM THE DROUGHT-PRONE AREAS IN GHANA

REGION	LOCATION	TREATMENT & TYPE OF STORAGE	TOTAL ROOTS FOR FOOD		LESS QUALITY FOR FOOD	PREMIUM QUALITY OF ROOTS	
			#	%	#	#	%
Northern	Golinga	Step pit	253	51	72	181	72
	Chirifoyoli	Step pit	248	47	97	151	61
	Gblahagu	Sand box	104	47	61	43	41
	Zoonayili	Sand box	97	46	72	25	26
Upper East	Abisiga	Step pit	66	25	47	19	29
	Barebare	Sand box	108	48	101	7	6
	Tampezua 1	Step pit	108	41	90	18	17
	Tampezua 2	Sand box	48	42	46	2	4
	Navrongo	Step pit	567	72	79	488	86
	Navrongo	Sand box	197	63	67	130	66
TOTAL	9	10	1,796	52	732	1,064	59



- β-carotene of 186 μg/g after storing for 4 months in sand storage was high (Simonne et al., 1993). Price of roots after storage was thrice that during harvest.
- 59% of roots out of 52% for food were premium quality. 27% sprouted for vine production, and only 21% losses (N = 3,412). Typically 90-100% of losses occurred within 2-3 weeks after harvest. High percentage of sprouts began at **18th week** (45% out of 1,973 roots) and loss only 1%.
- Each sprouted root provides **40 sprouts** at 1st harvest, and **80 – 100 sprouts** at 2nd harvest, a month later.

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RESEARCH PROGRAM ON Roots, Tubers and Bananas

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