AfricaYam II Annual Progress Report

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AfrcaYam Project Annual Review & Work Plan Meeting Grand Pela Hotel, Abuja 15th – 17th Aeptember, 2022.

Ebonyi State University

AfricaYam

Project Title: Enhancing yam breeding for increased productivity and improved quality in West Africa (**AfricaYam Phase II**)

Objective: To enhance food security and improved livelihoods by increasing productivity and sustainability of yam cultivation and reducing the costs for small holder producers and consumers in West Africa.

AfricaYam Phase II:
Activities, Milestones and Deliverables at EBSU from 1st April 2021 – 31st March 2022

Primary Outcome 1 – Human capacity for breeding in NARS strengthened.

1.1.1.2. Joint training on methodologies for sensory evaluation, textural determination and food quality assessment

➢ Three staff of EBSU-IITA AfricayYam project – Prof Happiness Oselebe, Prof Folunsho David-Abraham and Ozi Friday Ugadu participated in the training organised by RTBfoods/AfricaYam held at at UAC, Benin, Nov 22-27, 2021.

➢ The workshop brought together food scientist and breeders to share experiences and learn from each other for more effective and efficient research/results.

The highlights included enjoying a boat ride to visit of the community living on water

➤ In-house training on data collection and methodologies for sensory evaluation, textural determination and food quality assessment.

1.1.2.3. Acquire field and lab equipment (handheld phenotyping tools)

Tablets are in good shape and are always deployed for data collection in the field.

Internet Modern,
Weighing scale,
pounding machines,
portable gas cooker,
pots, etc

Modern Yam Barn constructed at CAS Campus, EBSU

1.1.2.4. Provision of mobility facilities

Topstar Motorcycle and Daylong Tricycle
Truck provided are in good shape and in use

1.2.1.2. Annual progress review and work planning meeting.

➢ Project Coordinator of EBSU AfricaYam Project team attended the PAM meeting in IITA, 29 – 30 March 2021.

➢ At the meeting, each country presented their breeding pipeline and targets for replacement.

➢ For Nigeria, the presentation was made by Dr Jude Obidiegwu of NRCRI

1.2.1.3. Exchange visit among the national partners

a) No exchange visit for the period under review.
b) However, we participated in several online meetings organized by AfricaYam Phase II Project team.
c) We were visited by the communication officer for video clip production, and then
d) Dr. Agre Patrne & Mr. Alex Edemodu in August 2022. During the visit they interacted with University's breeding team in the field
e) Experiences were shared and lessons learned

Primary Outcome 3 – Next generation of superior yam varieties for traditional and emerging products

3.1.1.1. Documenting farmer's and consumer's trait preferences and demand for improved yam varieties.

Indicators:

➢ Partly done during the PVS at harvest of the MLTS

➢ Survey was conducted in partnership with NRCRI and will be reported by NRCRI.

Indicators

➢ Ten 10 *D. rotundata* and 9 *D. alata* landraces were identified, collected and planted out in our research field.

➢ The trials were laid out in randomized complete block design with 3 replications.

➢ The landraces were phenotyped for agronomic, pest, disease traits. At harvest, food quality traits were also evaluated using AfricaYam Project SOP.

D. alata popular landraces planted out on 3rd July 2021

TDr accessions:Agbaocha, Ella, Nwopoke, Obela Ishielele, Obiaoturgo, Ogbagharogbia, Okpebe-akpu, okpebe ishielele, Utsekpe and TDr Ekpe

Table 1 Mean performance of popular TDr landraces evaluated

Accession_name	NBTP	NMTP	NSTP	TNTP	TTW
Agbaocha	2	3	4	9	6.5
Ella	4	3	4	11	10.8
Nwopoke	6	3	9	19	**14.2**
Obela Ishielele	3	4	5	12	8.7
Obiaturugo	3	4	9	16	9.7
Ogbagharaogbia	2	4	10	15	8.0
Okpebe Akpu	2	2	8	12	6.4
Okpebe Ishielele	5	3	11	19	**16.9**
TDr Ekpe	5	1	7	13	9.7
Utsekpe	5	4	8	17	10.8
Mean	3.7	3.1	7.5	14	10.2
Stdev	1.5	1.0	2.5	3	3.3

Table 2. Yield performance of 10 *D. alata* accessions for yield traits

Accession Names	Tota No tubers/plot	Total tuber weight	Total yield (kg/ha)
Tda-Mbala-Akara	14.0	5.6	161.5
TDa-Nneowuka	13.3	5.0	141.4
TDa-Okwalenwankata	21.7	7.0	309.5
TDa-Meme	11.0	4.8	105.6
TDa- Mbala-Ite	9.0	4.2	75.8
TDa-Nwa-awafu	16.3	7.0	231.7
TDa-Egboro	9.7	4.5	97.5
TDa-Ejuru	13.3	5.9	167.7
TDa- Akpuru-akpu	9.3	6.5	131.1
Mean	30.2	6.6	199.1
FLSD$_{0.05}$	2.1	2.1	1.4

3.5.1.1. Conduct regional coordinated G x E trials for _D. rotundata_ and _D. alata to_ identify best varieties for homologous growing environments within and across countries

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Milestone: Share and initiate multiplication of promising advanced clones (14 test clones and one standard variety, and one check) for seed-balking per program.

Indicators:

➢ Two Sets of 14 _D. rotundata_ test clones, plus one standard variety as check were sent from IITA, i.e. MLT1 & 11 for _D. rotundata_ and one MLT for _D. alata._

➢ These were repeats of 2020 trials.

➢ The trials were planted on 17ᵗʰ May, 2021 following AfricaYam SOP

➢ All necessary data were collected for analysis

Table 3 Mean performance of *D. rotundata* genotypes (MLT 1)

Genotypes	Yield(tons/ha)
TDr1400537	13.70
TDr0900135	10.70
TDr1000021	10.33
TDr1401220	10.17
TDr8902665	7.85
TDr1400158	7.47
TDr1100180	7.35
TDr1400766	6.85
TDr1100055	6.13
TDr0900295	6.10
TDr1400359	5.60
TDr1401593	5.38
TDr1401161	5.28
TDr1100128	3.00
TDr1401785	2.57
TDrMeccakusa	7.40
MSD	**13.41**
CV	**61.14**
SEM	**0.72**

PVS for *D. rotundata test clones* (MLT 1)

➢ PVS was conducted within 2 weeks after harvest to identify the best genotypes using food quality indicators - the identified criteria for tuber, cooked and pounded yam ranking.

Table 4: Farmer preferred traits at harvest for ranking/selection of *D. rotundata* clones.

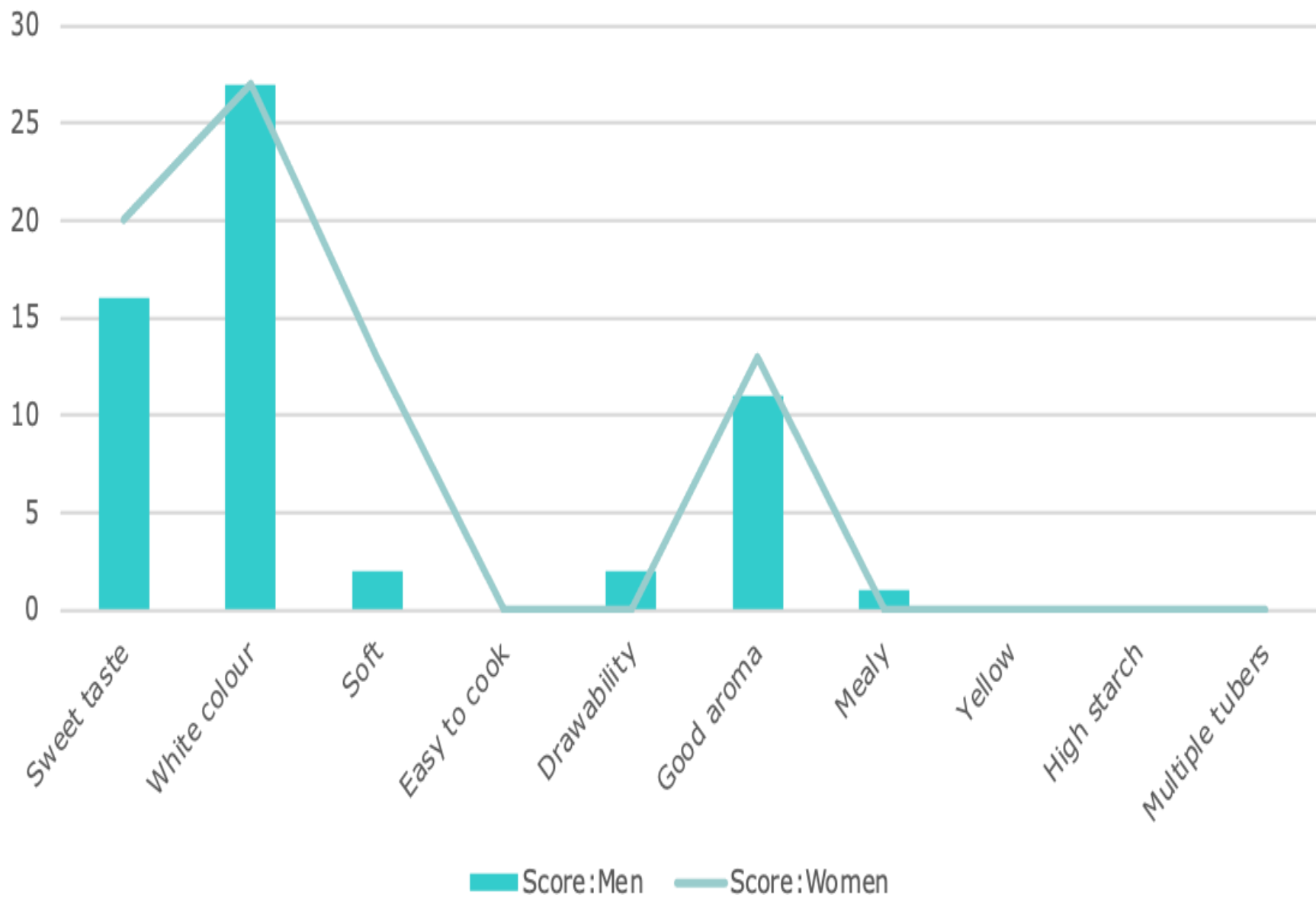| Identified criteria	Score: Men	Order of Importance: Men	Score:- Women	Order of Importance: Women	Global score	Global ranking
Tuber quality						
Disease Free	21	1	22	3	43	1
Big size	18	2	22	7	40	2
Name of Variety	13	3	7	-	20	3
Smoothness of tuber	6	4	9	1	15	4
Regular shape	2	-	0	3	2	5
Cooked yam quality						
White colour	27	1	27	1	54	1
Good aroma	11	3	13	3	24	3
Soft	2	4	13	3	15	4
Drawability	2	4	-	-	2	5
Mealy	1	5	-	-	1	6
Easy to cook	-	-	-	-	-	-
Yellow	-	-	-	-	-	-
High starch	-	-	-	-	-	-
Pounded yam quality						
Drawable	25	1	27	1	52	1
White colour	22	2	21	2	43	2
Smooth	9	3	9	3	18	3
Rise in size	2	4	3	4	5	4
Easy to pound	2	4			2	5
No balls	-	-	-	-	-	-
Yellow	-	-	-	-	-	-

Gender ranking of identified criteria for cooked yam quality
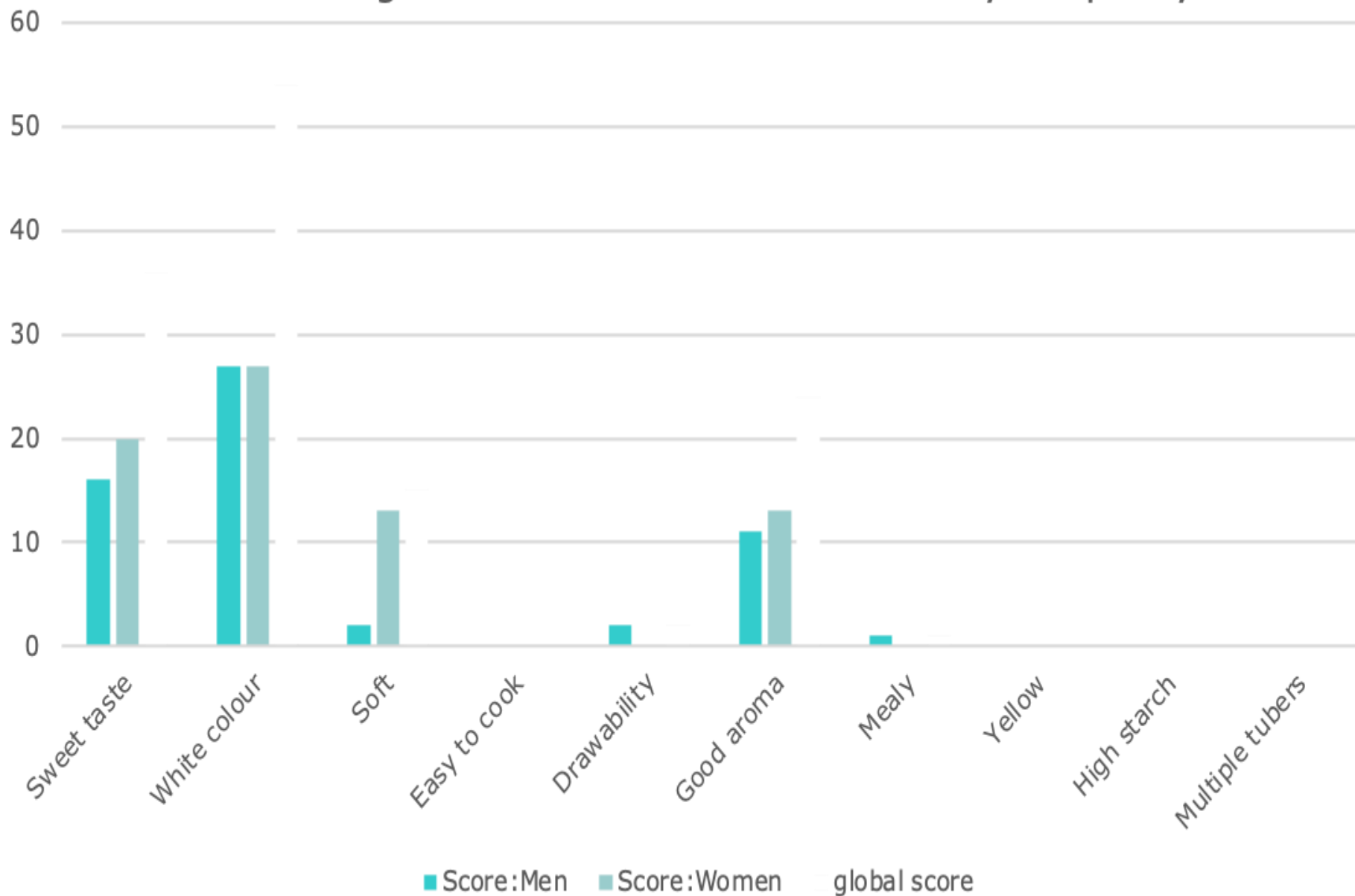
Ranking of Identified criteria for tuber quality by gender

Score:Men   Score:Women

Gender ranking of identified criteria for pounded yam quality

Legend: Score of men ■ Score:Women ■ Global score □ Global ranking ■
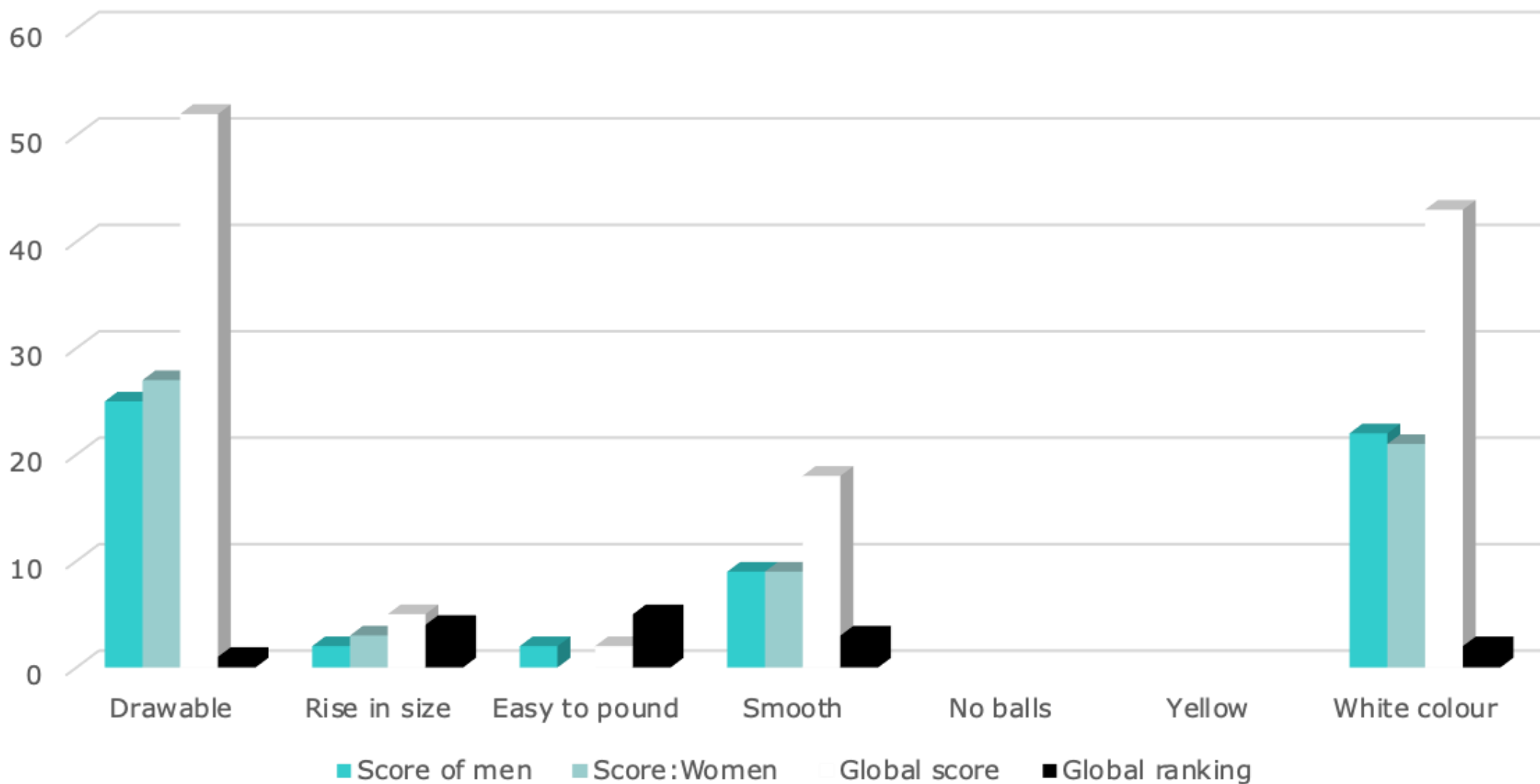
Table 5 Ranking of Clones/Genotypes for MLT 1 (*D. rotundata*)

Clone ID	Score of men	Order of Importance Men	Score: Women	Order of Importance Women	Global score	Global ranking
TDr1401161	25	1	25	1	50	1
TDr1100055	12	2	12	3	24	2
TDr0900135	5	3	14	2	19	3
TDr1100180	5	3	5	4	10	4
TDr1401220	4	4	2	5	6	5
TDr1400158	5	3	-	-	5	6
TDr1400766	2	5	-	-	2	7
TDr8902665	-	-	1	6	1	8
TDr1401419	-	-	1	6	1	8
TDr1100128						
TDr1000021						
TDr0900295						
TDr1400537						
TDrNwopoko						
TDr1400766						
TDr1400359						
TDr1401593						

➤ For tuber quality parameters: TDr1401161, TDr1100055, TDr0900135, TDr1100180 and TDr1401220.

➤ Selected over the local best TDrNwopoko and the national check TDr8902665.

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Analyses of the harvest data for RVT indicated 5 *D. rotundata* genotypes that performed better than others

5 Outstanding *D. rotundata* test clones:

1. TDr1439027,
2. TDr1437005,
3. TDr1443002,
4. TDr1440001, and
5. TDr1436015

Table 6: Identification of preferred *D. rotundata* genotypes from the regional variety trial

S/N	Genotypes	Total No tubers/plot	Total tuber weight	Total yield(kg/ha)
1.	TDr 1414005	21.0	16.4	22819.4
2.	TDr 1417015	24.9	21.0	29208.3
3.	TDr 1418006	21.3	21.3	29576.4
4.	TDr 1428017	32.0	17.0	23548.6
5.	TDr 1430007	29.1	19.3	26812.5
6.	TDr 1439018	23.9	15.0	20805.6
7.	**TDr 1429027**	**29.4**	**31.7**	**43986.1**
8.	**TDr 1443002**	**26.8**	**27.5**	**38173.6**
9.	**TDr 1437005**	**29.3**	**27.5**	**38194.4**
10.	**TDr 1439027**	**38.3**	**25.4**	**35305.6**
11.	**TDr 1436015**	**18.2**	**25.3**	**35145.8**
12.	**TDr 1440001**	**21.2**	**24.9**	**34618.1**
13.	TDr 1440035	18.3	21.6	30055.6
14.	TDr 1444003	22.8	18.7	26020.8
15.	TDr 8901665	42.4	23.1	32055.6
16.	TDr RvT-lcl 21NG	21.8	23.6	32840.3
	Mean	26.3	22.5	31197.9
	$FLSD_{0.05}$	16.2	11.3	17656.8

Regional Variety trial for water yam (*D. alata*)

Indicators:

a) One sets of 10 *D. alata* test clones, plus one standard variety as check were sent to us from IITA.

b) One popular variety within our locality - Okwalenkata was used as a local check.

c) Field was established and data collected following Yam SOP.

Regional Variety trial for *D. alata*

For RVT TDa, the following genotypes were selected:

1. TDa1520009,
2. TDa1520002,
3. TDa1510010,
4. TDa1520008, and
5. TDa1511008

Table 7. Mean performance of *D. alata* genotypes (MLT 1) for yield per hectare.

Genotypes	Yield(tons/ha)
TDa1100374	24.47
TDa1100224	23.97
TDa1401253	21.97
TDa1415201	19.73
TDa1412030	19.53
TDa0000194	19.37
TDa1100247	18.83
TDa1100250	18.53
TDa1400301	16.37
Okwalenkata	14.43
MSD	20.467
CV	35.897
SEM	0.98

Table 8: Farmer preferred traits at harvest for ranking/selection of *D. alata* clones at EBSU

S/N0	Identified criteria	Men Score	Men Order of Importance	Women Score	Women Order of Importance	Global score	Global ranking
	TUBER QUALITY						
1	Big tuber	21	1	22	1	43	1
2	Disease free	15	2	12	2	27	2
3	Smoothness	9	3	11	3	20	3
4	Long tuber	8	4	3	5	11	4
5	High yield			10	4	10	5
6	High multiplication ratio	3	6			3	7
7	Good storability	5	5	3	5	8	6
	COOKED QUALITY						
1	White colour	23	1	27	1	50	1
2	Sweet taste	18	2	18	2	36	2
3	Good aroma	15	3	8	3	23	3
4	Hard to cook			2	5	2	5
5	Strarch	2	4	3	4	5	4
	POUNDED YAM QUALITY						
1	White colour	30	1	23	1	53	1
2	Drawable	17	2	18	2	35	2
3	Lumpless	11	3	11	3	22	3
4	Easy to pound	2	4	8	4	10	4
5	No retrogression						
6	No hairs						

Table 9. Farmers' choice of *D. alata* genotypes using identified important traits (MLT 1)

S/N0	Clone ID	Men		Women		Global score	Global ranking
		Score	Order of Importance	Score	Order of Importance		
1	TDa1100224	3	4	2	5	5	4
2	TDa1400301	27	1	19	1	46	1
3	TDa1100247	19	2	15	3	34	2
4	TDa1100250	7	3	16	2	23	3
5	TDa1100374			5	4	5	4
6	TDa0000194						
7	TDa1401253						
8	TDa1415201	1	6			1	6
9	TDaOkwalankata	2	5	2	5	4	5
10	TDa1412030			1	6	1	6

Establishment of Crossing Block for recombination

Profuse male flowering of Asiedu known and used as female parents

Successful pollinations at EBSU Female Crossing Block

Table 10. Successful crosses at Ebonyi State University

Crosses	Date of bagging	Date of pollination	Number pollinated	No. Of spikelet	Seed Harvested
TDrNwopoko X Asiedu	26/08/2020	28/08/2020	150	100	200
	25/08/2020	28/08/2020	150	66	128
	28/08/2020	30/08/2020	200	162	302
	28/08/2020	30/08/2020	200	102	204
	25/08/2020	28/08/2020	635	608	1216
				1038	2050

Establishment of seedling progenies using botanical seeds)

Challenges/Recommendation

➢ There is still a critical need to study in detail sexual expressions in yam.

S/N	Name of student	Trials handled	Remarks
1	Otenyi Felix	Regional Variety Trial for TDr	These students have been trained on the use of tablets for data collection. Moreover, everything done using yam SOP.
2	Okoh Faith	Regional Variety Trial for TDa	
3	Nwibo Ozioma B	Characterization/evaluation of 10 popular TDr landraces	
4	Ukor Fred	Characterization of 9 popular TDa Landraces	
5	Obiya Sabinus Obia	Germination and early evaluation of seedlings generated from 3 populations of TDr botanical seeds.	
6	Oko Ugochi Blessing	MLT II for TDr	

AfricaYam Day Celebration, EBSU

➤EBSU Breeding Team celebrated "AfricaYam Day" in the university on 24th March 2022.

➤This is meant to showcase the outputs of the project since inception, including the released varieties proceeding from research results under the project.

➤The Vice-Chancellor of EBSU, Deans and Directors, students, farmers, stakeholders and government were invited and were part of the celebration.

➤Achievement: Public were sensitized on the availability and the need to plant improved varieties of yam.

Participants enjoying roasted yam during the AfricaYam Day celebration

SHOW & TELL

Work Plan for 2022

Activities	First half: 1 April 2022 – 30 September 2022
1.1.2.3. Acquire field and lab equipment (handheld phenotyping tools) in each national program to ensure quality data for breeding trials	Field and lab equipment in use
1.2.1.2. Annual progress review and work planning meeting.	
1.2.1.3. Exchange visit among the national partners per year.	
3.1.1.1. Documenting farmer's and consumer's trait preferences and demand for improved yam varieties.	Conduct survey to document farmer's and consumers trait preferences and demand for improved yam per NARS partners (at least 150 farmer survey per country) conducted.
3.1.1.4. Attend annual product design and breeding pipeline refinement meetings.	
3.2.1.1. Phenotype popular local varieties for agronomic, pest, disease and food quality traits to dissect the genetic basis of the relevant traits and their improvement.	At least ten popular farmers varieties identified per NARS program and reported.

Work Plan for 2022

Activities	First half: 1 April 2022 – 30 September 2022
3.5.1.1. Conduct regional coordinated G x E trials of white yam to identify best varieties for homologous growing environments within and across countries.	GxE trials in at least three locations established per program.
3.5.1.2. Conduct regional G x E trials of water yam to identify best varieties for homologous growing environments within and across countries.	GxE trials in at least three locations established per program.
3.5.2.1. Prepare data formats and trial protocols using the tricot approach and ClimMob digital platform.	Traits identified, data formats prepare, and protocols developed for tricot approach.
3.5.2.2. Train NARS staff in the tricot approach and ClimMob digital platform.	One NARS staff per program trained in tricot approach
3.5.2.3. Conduct on-farm testing (OFT) of yam varieties using the tricot approach and ClimMob digital platform.	Trial farmers identified and on-farm testing established (at least 50 on-farms per program).

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Acknowledgements

1) BMGF
2) IITA and NRCRI
3) Ebonyi State University Management