

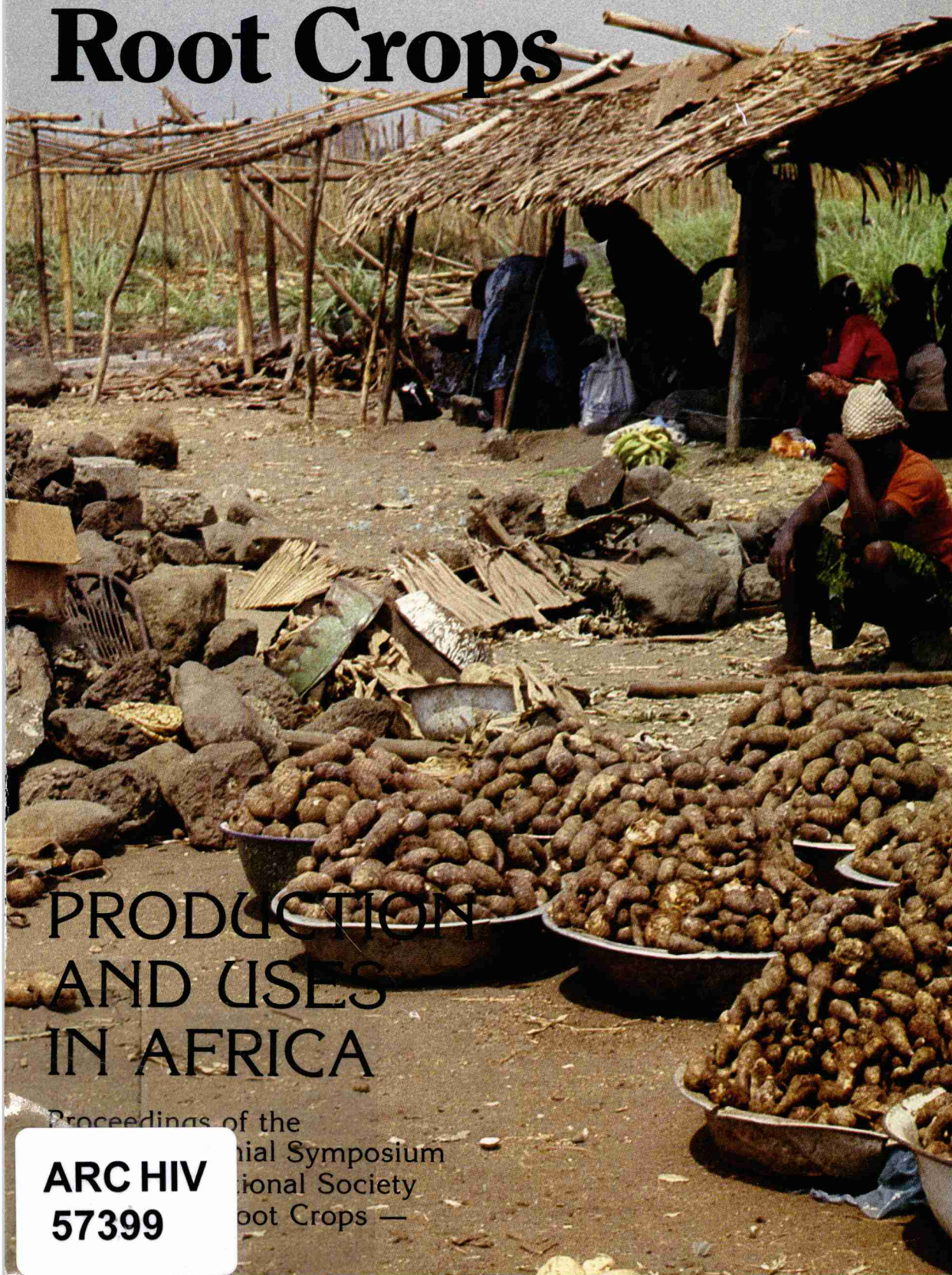
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# Tropical Root Crops

## PRODUCTION AND USES IN AFRICA

Proceedings of the  
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The International Society for Tropical Root Crops — Africa Branch was created in 1978 to stimulate research, production, and utilization of root and tuber crops in Africa and the adjacent islands. The activities include encouragement of training and extension, organization of workshops and symposia, exchange of genetic materials, and facilitation of contacts between personnel working with root and tuber crops. The Society's headquarters are at the International Institute of Tropical Agriculture in Ibadan, Nigeria, but its executive council comprises eminent root and tuber researchers from national programs throughout the continent.

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## **ABSTRACT**

A mixture of original research, updates on procedures, literature reviews, and survey reports, this document resulted from the second symposium of the International Society for Tropical Root Crops — Africa Branch, with 77 participants from 16 countries. The focus was cassava, yams, cocoyams, and sweet potatoes, from the perspectives of breeders, agronomists, soil specialists, plant pathologists, entomologists, nutritionists, food technologists, etc. Learning from past successes and failures, many of the researchers directed their efforts toward problems obstructing progress in reaching improved production and use of root crops and attempted to view, realistically, the context in which their results would be applied.

## **RÉSUMÉ**

Résultats de recherches récentes, mises à jour sur les méthodes de recherche, revues de publications et rapports de sondages sont contenus dans ce document issu du Deuxième symposium de la Société internationale pour les plantes-racines tropicales — Direction Afrique, qui a réuni 77 participants de 16 pays. Des communications sur le manioc, le taro, le yam et la patate douce ont été présentées par des phytosélectionneurs, des agronomes, des pédologues, des phytopathologistes, des entomologistes et des spécialistes de la nutrition et des aliments, entre autres. Tirant leçon de leurs succès et de leurs échecs, beaucoup de ces chercheurs ont dirigé leurs efforts vers la solution des problèmes qui entravent l'augmentation de la production et de la consommation des plantes-racines et ont tenté de considérer d'un œil réaliste le contexte qui sera celui de l'application de leurs recherches.

## **RESUMEN**

Una mezcla de investigaciones originales, actualizaciones de procedimientos, reseñas de literatura e informes de encuestas, este documento es el resultado del segundo simposio de la Sociedad Internacional de Raíces Tropicales, Filial Africana, que contó con 77 participantes de 16 países. El simposio se centró en la yuca, el ñame, el cocoñame y las batatas, desde la perspectiva de los fitomejoradores, los agrónomos, los especialistas en suelos, los patólogos vegetales, los entomólogos, los nutricionistas, los tecnólogos alimenticios, etc. A partir de los éxitos y fracasos anteriores, muchos de los investigadores encaminaron sus esfuerzos hacia los problemas que obstaculizan el avance para lograr una producción y un uso mejorados de las raíces y trataron de obtener una visión realista del contexto en que los resultados pueden ser aplicados.

# **TROPICAL ROOT CROPS:** **PRODUCTION AND USES IN AFRICA**

**EDITORS: E.R. TERRY, E.V. DOKU, O.B. ARENE, AND N.M. MAHUNGU**

*PROCEEDINGS OF THE SECOND TRIENNIAL SYMPOSIUM OF THE INTERNATIONAL  
SOCIETY FOR TROPICAL ROOT CROPS — AFRICA BRANCH HELD IN DOUALA,  
CAMEROON, 14 – 19 AUGUST 1983*

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# ON-FARM TRIALS AS A LINK BETWEEN RESEARCH AND TECHNOLOGY TRANSFER

H.J. PFEIFFER<sup>1</sup>

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The steps taken by the Cameroon National Root Crops Improvement Programme in its attempts to popularize sweet potato are presented, as are the results of researcher-managed verification trials on farms and farmer-managed trials. Compared with local cultivars, the varieties tested by the program proved to be highly productive, with good quality, in all the agroecological areas in Cameroon. Field days were organized at harvest time, emphasizing improved production techniques. Farmers made their own choices and took cuttings from the best clonal material for multiplication and production on their farms.

The general objective of the Cameroon National Root Crops Improvement Programme (CNRCIP) is to develop improved production systems suitable and acceptable for use by small-holder, subsistence farmers. Specifically, CMRCIP undertakes:

- Selection for disease- and insect-resistant root crops, having high yield potential, high nutritive quality, good consumer acceptance, and wide adaptability;
- Development of cultural practices that maximize returns from improved or local varieties with minimum inputs.

A practical procedure has been developed involving research-station and on-farm trials. Genetic improvement, selection with large numbers of clones, and studies on physiology and production techniques with high risk are concentrated at the research stations. On-farm research includes researcher-managed verification trials, farmer-managed trials, and agroeconomic surveys, which, to date, have been informal with information being collected from extension agents and farmers.

During the 1982 agricultural campaign, on-farm trials with sweet potato were conducted across the South Cameroon Continental Land (forest and savanna) and the Adamaoua agroecological areas. The steps followed are noteworthy and may prove useful elsewhere. The cropping techniques were standardized as much as possible.

The aim was to test the adaptability and stability of nine selected sweet-potato clones: their general performance, tolerance to pests and disease, ground coverage, etc.; test the acceptability of the clones for different ethnic groups and eating habits; identify the major constraints (biophysical and socioeconomic) for sweet-potato production in the areas; organize field days in collaboration with the extension agents to show the potential of the new material as well as improved agronomic practices to the farmers; and assist farmers in the multiplication and distribution of the best material.

Where facilities permitted, the researcher-managed verification trials were conducted within the most representative production domains of each agroecological area. A basic plot, 3 m × 10 m, was laid out for each clone and was replicated 3–5 times, depending on the facilities available on site.

The trials that were farmer managed relied on the good will of farmer groups or individuals who provided land (200 m<sup>2</sup>) and labour. Their reward was the final yields. A simple trial with no replications inside a farm was laid out with three rows per clone (including the local) and two rows of the local variety at each end of the plot.

These trials were used for field days at harvest, and the farmers were invited to assess the clones on the basis of production and acceptability levels. The use of healthy planting materials and appropriate cultural techniques in planting, weeding, etc. were demonstrated and emphasized at these occasions.

Comparisons among trials in the same loca-

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<sup>1</sup> Cameroon National Root Crops Improvement Programme, Institute of Agronomic Research, Yaounde, Cameroon.

Table 1. Average root yields (t/ha) for sweet-potato trials on farms in three agroecological areas of Cameroon, 1982.

Trials			Yield (t/ha)					
	Manager	Number	Tib 1	Tib 2	23303	527034	Tib 2498	Local
<b>1st season</b>								
South Cameroon								
Continental Land								
Forest	Researcher	2	20.7	17.0	18.3	15.6	—	6.6
	Farmer	9	14.8	13.1	10.8	12.5	—	5.0
Savanna	Researcher	2	34.7	27.5	24.8	32.2	—	19.3
	Farmer	14	12.8	9.4	8.4	12.9	—	5.0
Adamaoua	Researcher	3	20.4	17.3	18.2	18.7	—	7.5
	Farmer	20	16.8	11.4	11.3	14.8	—	7.7
<b>2nd season</b>								
South Cameroon								
Continental Land								
Forest	Researcher	1	7.9	6.4	3.2	8.7	4.8	0.5
	Farmer	5	8.3	9.2	5.7	9.9	7.5	4.9
Savanna	Researcher	2	25.1	19.7	15.7	16.7	9.8	9.8
	Farmer	20	10.5	9.4	7.9	10.0	7.2	6.1
Adamaoua	Researcher	2	12.3	10.7	11.5	10.9	6.4	3.5
	Farmer	12	10.8	6.7	6.6	9.1	7.1	5.1

Table 2. Major characteristics of sweet-potato clones as assessed by farmers (compiled over all agroecological areas).

	Tib 1	Tib 2	23303	527034	Tib 2498	Local
Groundcover	Good, very good	Good	Medium	Good	Medium	Medium, good
% germination	Very good	Good	Good	Good, very good	Medium	Good
Resistance						
Virus	Good	Good	Medium, good	Medium	Very good	Medium, good
Weevil	Medium	Medium	Poor, medium	Good, very good	Poor, medium	Poor, good
Yield						
Total	Very good	Medium, very good	Medium	Good	Medium	Poor, medium
Commercial	Good, very good	Good	Medium	Good	Medium	Poor
Tuber						
Shape	Oval	Oval, long	Round	Oval	Long	Long, round
Uniformity	Very regular	Slightly irregular	Regular	Regular	Very regular	Irregular
Skin colour	White	White	Rose	Red	Red	—
Flesh colour	Yellow-orange	Cream	White	Yellow	White	White-orange
Tuberization	Clustered	Spreading	Clustered	Clustered	Spreading	Spreading
Ease of harvest	Easy	Difficult	Easy	Quite easy	Quite difficult	Difficult
Storage (locally)	Good	Medium	Poor	Good	—	Good
Taste	Good, very good	Medium	Poor	Good, very good	Good	Poor, medium
General appreciation	Very good	Medium	Poor	Medium	— <sup>a</sup>	Poor, medium

<sup>a</sup>To be assessed.

Table 3. Major production constraints for three agroecological areas, Cameroon, 1982.<sup>a</sup>

Constraint	1st season						2nd season					
	Researcher-managed			Farmer-managed			Researcher-managed			Farmer-managed		
	Savanna	Forest	Ada-maoua	Savanna	Forest	Ada-maoua	Savanna	Forest	Ada-maoua	Savanna	Forest	Ada-maoua
Virus	-	-	X/-	X/-	X/-	X/-	-	-	-	-	X/-	-
Weevil	-	-	-	-	-	-	X	X	X	X	X	X
Soil	X/-	-	-	X/-	XX/-	X/-	X	-	X	X/-	XX/X	XX/-
Rain	-	-	-	-	-	-	X	X	X	X	X	X/XX
Light	-	-	-	XX/-	X/-	-	-	-	-	X	-	-
Animals	X/-	-	-	XXX/-	X	X/-	-	-	X/-	X/-	X	X
Planting	-	-	-	X/-	X/-	XXX/-	-	X/-	-	X/-	X/-	XXX/-
Weeding	-	-	-	XX	XX/X	XX/-	-	X/-	-	X/-	X	XX/-

<sup>a</sup> - no visible limitation; X moderate limitation; XX severe limitation; and XXX very severe limitation.

tion took place, and the participants were invited to identify the constraints and explain the production differences between trials. Informal discussions on commercialization, storage problems, cooking possibilities, etc. were also held. Finally, everybody took cuttings from the best clones to his or her farm for multiplication.

The extension agents from the Ministry of Agriculture, development organizations, etc. were invited to participate in every stage at all farmer-managed trials in their respective zones. Most were also actively involved in a verification trial and assisted in identifying the major production constraints.

## RESULTS AND DISCUSSION

Results of the trials were encouraging, with all the improved cultivars practically doubling yields obtained from the local variety in both researcher- and farmer-managed trials (Table 1). Tib 1 consistently performed well, yielding 351% more than the local cultivar in one series of researcher-managed trials. Moreover, Tib 1 and 527034 tasted better than the local material (Table 2). In trials where yields of improved cultivars are only marginally better than local cultivars, taste trials are sometimes important. The uniformity in root shape as well as the clustering habit of Tib 1 and 527034 were highly appreciated because of the easy harvest.

Only a few farmer-managed trials failed because of lack of care. In most cases, special attention was paid to these trials, and the new planting material made an excellent impression on the farmers, any skepticism being removed at harvest. For the farmers, the level of significance of a statistical analysis has no meaning; if they cannot easily see the difference, they will con-

tinue to use materials and techniques that have proved suitable in the past.

Comparing the researcher-managed trials with the farmer-managed trials during the first season for each zone indicated an average yield loss of between 31.7% (local clone) and 48.3% (23303). The largest yield loss between the two types of trials was observed in the area (South Cameroon Continental Land — savanna) where the potential production was the highest (65.9% loss over all clones). The reasons for these losses were evaluated (Table 3), and the most important ones — land choice and preparation, planting method, and weeding — are dealt with in the 1983 on-farm trials.

The savanna area of the South Cameroon Continental Land (600–800 m, 1400–1600 mm annual rainfall, bimodal) seems to be the most favourable area for sweet-potato production during both cropping seasons. The other two areas have similar production potentials but with different constraints. The first season's production was higher than the second season's over the same cropping period (4 months), in all locations. The stability of the two highest performing clones in 1982 (Tib 1 and 527034) is being evaluated during 1983, over a larger area. A major constraint, over all areas, for early season production is the lack of planting material — a problem that could be solved if small plots were maintained on the compound or in a swampy area for dry-season production of planting materials.

In future, farm storage of sweet potatoes has to be improved, and new methods of cooking need to be explored, especially for the preparation of the leaves as vegetables.

Thanks to E. Carter and J.B. Abaka Whyte for useful suggestions and for reviewing this paper.