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Research Application Summary

Increasing farmers' access to conserved yam genetic resources –a case study in Southern Ghana

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Abstract

A study previously conducted revealed that a greater proportion of yams being conserved by farmers on-farm are becoming extinct. Some of these yams are also being conserved at the gene bank. A strategy was formulated to increase farmers' access to these materials through regeneration, multiplication and distribution to farmers. A total of 89 accessions of yams (*D. alata*-40 accessions; *D. rotundata* – 42 accessions and *D. esculenta* – 7 accessions) were multiplied resulting in 1500 minisetts. The materials were distributed to 30 farmers (25 males and 5 females), in three communities in Southern Ghana to multiply for further distribution. In all, 300 farmers benefitted from the project thus increasing their access to conserved yam germplasm and broadening their genetic stock. Challenges, success factors and lessons learnt were enumerated to guide future studies.

Key words: Genetic variability, mini setts, seed multiplication, water yams, white yams

Résumé

Une étude précédemment menée a révélé qu'une partie importante des variétés d'ignames conservées par les agriculteurs à la ferme s'érodait. Certaines sont également conservées à la banque de gènes. Une stratégie a été formulée pour améliorer l'accès des agriculteurs à ces matériels à travers la régénération, la multiplication et la distribution aux agriculteurs. Au total, 89 souches d'ignames (D. alata-40 souches; D. rotundata - 42 souches et D. esculenta - 7 souches) ont été multipliées, donnant au total 1500 mini-souches. Le matériel végétal a été distribué à 30 agriculteurs (25 hommes et 5 femmes), au sein de trois communautés au sud du Ghana, afin de les multiplier pour une distribution ultérieure. Au total, 300 agriculteurs ont bénéficié du projet, augmentant ainsi leur accès au matériel génétique d'igname conservé de même que le stock génétique. Les défis, les facteurs de réussite et les leçons apprises ont été énumérés à d'autres fins de recherche future.

Mots clés: variabilité génétique, mini-souches, multiplication des semences, ignames aquatiques, ignames blanches

Background and rationale

Invariably, a lot of yam germplasm being held by farmers are getting extinct due to a number of biotic and abiotic factors. It is a common knowledge that accessions under conservation in gene banks are also being lost due to improper conservation, especially under field conditions (Aboagye *et al.,* 2012). For variability to be greater, such materials must be conserved under field conditions to allow evolutionary processes to occur rather than *in-vitro,* where the genes are static. However these two methods complement each other for successful conservation.

In Ghana seven species of yam are known to be cultivated for various uses. Different ethnic groups have special preference for some species or cultivars as staple or delicacy (Akromah, 1993). The seven species are *Dioscorea alata* (Water yam), *D. bulbifera* (aerial yam), *D. cayenensis* (Yellow Guinea yam), *D. dumetorom* (Bitter yam), *D. esculenta* (Chinese or potato yam), *D. praehensilis* (Bush yam), and *D. rotundata* (White Guinea yam) (Aboagye *et al.,* 2011). The two most important species in terms of production are water and white Guinea yams (Hahn *et al.*, 1987; Dansi, 2000). Over concentration of production of white and water yams has rendered other species and their inherent diversity vulnerable to extinction (Eastwood and Steel, 1978). A survey was conducted in yam growing communities in southern Ghana, on the diversity of yam species, extent of production, preference and challenges that confront the production of yam. The study revealed that most of the 136 accessions were cultivated in a small area by few households (67.5%-96.3%) an indication of loss of genetic diversity of yams especially the lesser known species (Aboagye *et al.,* 2015).

Objectives

The objective of this study was to multiply various cultivars of yams getting extinct for distribution to farmers to increase their access to the cultivars for increased yam production and conservation.

Methodology

i. Site selection. Three communities in Ghana noted for yam production were selected (Bennett-Lartey *et al.,* 1995; Bennett-Lartey *et al.,* 1997). Dinkro community near Maame Krobo in the Afram Plains District of the Eastern Region, Mfadwen/ Bontrase in the Ewutu-Senya District of the Central Region and Nyankumase in the Sekesua area of the Upper Manya District, in the Eastern Region. At each location, ten farmers were selected to participate in yam production as part of the study.

Multiplication

The mini-sett technology (Bennett-Lartey *et al.,* 1995), was used to multiply 89 accessions: *D. alata* (40 accessions, *D. rotundat*a (42 accessions) and *D. esclulenta* (7 accessions). Plates 1-8 shows the stages for the preparation, transplanting and nursing of the mini-setts. The setts were cut and treated with a mixture of fungicide, bactericide, insecticide, and nematicide suspension. The pre-sprouting technique of the mini-set seed yam production was done on beds. The setts were transplanted 3 weeks after sprouting (Plates 10-11). Staking was done when the vines were 1m tall.

Plates: 1. Whole yams; 2. Cut minisetts; 3. Setts treatment; 4. Curing of setts ; 5. Nursing pre-sprouting setts; 6. Nursing setts on beds; 7. Picking of setts from beds and 8. Field transplanting

Plates: 9. *D. alata*; 10. D. *esculenta* and 11. D. *rotundata*

Plates 9, 10 and 11 show the propagation of the three yam species under field conditions.

Table 1 shows the yam species, numbers of each species multiplied and the total setts distributed to farmers. A total of 1500 setts were distributed to farmers.

Table 1. Species of yams, number of accessions, number produced and number distributed

Yam Spices	Number of Accessions multiplied	Number of setts distributed
D alata	40	600
D rotundata	42	600
D esculenta	7	300
Total	89	1500

Plates: 12. *D. alata*; 13. *D. esculenta* and 14. *D. rotundata*

Plates 12, 13 and 14 show the harvested minisetts, 6-7 months after transplanting. The yams were harvested and cured for three days and stored in a yam barn.

Thirty farmers each at Mfadwen/Bontrase, Dinkro and Mame Krobo were supplied with the sett, for further multiplication and distribution to other farmers. Plates 15a and 15b show farmers receiving the minisetts for planting materials. Plates 16a, 16b and 16c show the yam fields at the three sites.

Plates 15a and 15b farmers receiving minisetts

iii. Field propagation of the distributed yams

Plates 16a- Mame Krobo; 16b- Nyankumase and 16c- Mfadwen/Bontrase

Table 2 shows the species, cultivar, locality and the gender of beneficiaries. In all, 1500 setts were distributed to farmers at the three locations, 500 setts each of the three species. Each farmer received fifty setts for 50 mounds. At Mfadwen/Bontrase and Nyankumase, seven males and three females and eight males and two females benefitted, respectively. At Dinkro, all the beneficiary farmers were males. In general yam production activities were carried out by men in the localities visited. However, in the identification of the various traits of importance, especially the culinary and storage properties women play a key role as earlier reported by (Kumara, 1996; Doefor, 1997; Ogata *et al.,* 2009). Plates 17a, 17b and 17c show the distribution of yam setts at Nyankumase.

Table 2. Cultivar distributed, locality, quantity and gender of beneficiaries

Cultivar	Species	Locality/Quantity Mfadwen/Bontrase	Locality/Quantity Dinkro	Locality Quantity Nyankumase	Total
Afase	*D. alata*	200	200	200	600
Dente	*D. rotundata*	100	80	100	280
Pona	*D. rotundata*	20	-	-	20
Labrako	*D. rotundata*	20	-	20	20
Oboaduonum	*D. esculenta*	100	100	100	300
Serwaa	*D. rotundata*	30	20	30	80
Brass	*D. rotundata*	-	50	50	100
Ntonto	*D. rotundata*	-	100	-	100
Total		500	500	500	1500
Beneficiaries		Male=7; Female=3	Male=10	Male=8; Female=2	

Plates: 17a. Participating farmers;17b. Official from MOFA presenting a paper on the project and 17c an official from a participating institution presenting minisetts to a farmer.

D. alata had the highest sprouting percentage of almost 100%, followed by *D. rotundata* 47.6%. and *D. esculenta* with the lowest sprouting success (22.2%). The percentage sprouting of the various yam species indicated how easy or difficult, working on particular species as far as mini-sett production is concerned. To forestall the low sprouting and to get more planting materials, other methods like vine cuttings can be used as a strategy for the production of planting materials.

Challenges and success factors

Key challenges noted during the study were: i) farmers were not willing to participate. Farmers initially agreed to participate but numbers dwindled with time when the expected incentives were not forth coming. ii) some farmers consumed yams which were meant for distribution to other farmers, reducing availability of materials for further distribution.

Nonetheless, certain positive results were obtained by farmers participating in the study as follows;

(i) Insect pests affecting yam were identified and farmers were trained in their control and management; (ii) Yams were treated for long term storage in improved yam barns;(iii) Conservation techniques and propagation methods were introduced to farmers; (iv) From the initial 30 farmers, 300 farmers have benefitted so far and (v) Farmers are becoming aware of genetic erosion and the need to conserve yam genetic resources.

Lessons learnt

The study demonstrated the importance of yam genetic resources for food security, income generation and improved livelihood. Continuous multiplication and distribution will ensure sustainable use of yam genetic resources. Farmers should be encouraged to conserve their yam genetic resources and technological packages relevant to farmers should be made available for their use.

Recommendation

A community gene bank should be established at all sites to produce yam setts for distribution to farmers and to serve as a learning centre for the dissemination of new technologies to farmers and enhance yam production.

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